

JUL 26 1994

MATHEMATICS 9

Learning Facilitator's Manual

"B" Pack

Please combine the second half of the Learning Facilitator's Manual with the "A" Pack you already have.

Module 4: Algebra

Gathering Materials

For this module the student will need the following items available from the Learning Resources Distributing Centre.

- Student Module 4: Algebra
- Assignment Booklet for Module 4
- optional course audiocassette for Module 4
- required videocassettes for Module 4 (*MATH MOVES: Equations – Solving in One Step*, *MATH MOVES: Equations – Solving With More Than One Step*)

Students may use the following computer programs if they have access to them and an Apple™ or compatible computer.

- *Computer Drill and Instruction: Mathematics, Level D* (SRA)
- *Problem Solving in Algebra* (Britannica)

In addition, the students will need a binder and loose-leaf paper for their responses, a scientific calculator with a $\frac{a}{b}$ key, and a geometry set.

Hold the Assignment Booklet for safekeeping until the student is ready for it.

Guiding the Student

Each section of Module 4 deals with a different aspect of algebra. Parts of Sections 2, 4, 6, 8, 9, 14, and 15 review previously developed skills. The Pretest in Section 1 will help you discover the student's strengths and weaknesses and make a personal study plan.

Ensure that the student reads the welcome pages and the module introduction, and does Section 1. Then check the answers to the Pretest (suggested answers follow). Help the student develop a personal study plan and schedule. An average student spends about eight weeks of a 40-week school year on Module 4.

Use the guidelines provided at the beginning of this guide to monitor the student's progress and provide encouragement.

Refer to the suggested answers in the Appendix of Student Module 4: Algebra when guiding the student through the Practice Activities in Module 4.

Section 1: Pretest

1. a. $a + 6 = 15$
 $a = 9$

b. $b - 4 = -4$
 $b = 0$

c. $5b = 30$
 $b = 6$

d. $3b = -24$
 $b = -8$

e. $4m + 1 = 17$
 $m = 4$

f. $3s + 5 = 2s - 1$
 $s = -6$

2. a. $x + 5 > 2$
 $x > -3$

b. $x - 3 < 8$
 $x < 11$

c. $3x < 21$
 $x < 7$

d. $2x > 16$
 $x > 8$

3. a. $x - 3 = 10$
 $\begin{array}{r} x - 3 \\ -3 \\ \hline x = 7 \end{array}$

b. $y - 4 = 8$
 $\begin{array}{r} y - 4 \\ +4 \\ \hline y = 12 \end{array}$

c. $y - 2 = -5$
 $\begin{array}{r} y - 2 \\ +2 \\ \hline y = -3 \end{array}$



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d. $3a = 18$

$$\frac{1}{\cancel{3}} \times \frac{\cancel{3}}{1} a = \frac{1}{\cancel{3}} \times \frac{6}{1}$$

$$a = 6$$

e. $-a = 5$
 $a = -5$

f. $-2a = 14$
 $2a = -14$

$$\frac{1}{2} \times 2a = \frac{1}{2} \times (-14)$$

$$\frac{1}{\cancel{2}} \times \frac{\cancel{2}}{1} a = -\left(\frac{1}{\cancel{2}} \times \frac{7}{1}\right)$$

$$a = -7$$

g. $\frac{x}{3} = 8$

$$\frac{1}{\cancel{3}} \times \frac{\cancel{3}}{1} x = 3 \times 8$$

$$x = 24$$

h. $\frac{x}{2} = \frac{3}{5}$
 $5x = 6$

$$\frac{1}{\cancel{5}} \times \frac{\cancel{5}}{1} x = \frac{1}{5} \times 6$$

$$x = \frac{6}{5} \text{ or } 1\frac{1}{5}$$

i. $3a + 2a = 15$
 $5a = 15$

$$\frac{1}{\cancel{5}} \times \frac{\cancel{5}}{1} a = \frac{1}{\cancel{5}} \times \frac{3}{1}$$

$$a = 3$$

j. $4a - a = 18$

$$3a = 18$$

$$\frac{1}{\cancel{3}} \times \frac{\cancel{3}}{1} a = \frac{1}{\cancel{3}} \times \frac{6}{1}$$

$$a = 6$$

k. $2(m+5) = 8$

$$\begin{array}{r} 2m + \cancel{10} = 8 \\ -\cancel{10} \quad -10 \\ \hline 2m = -2 \\ \frac{1}{2} \times 2m = \frac{1}{2} \times (-2) \\ \frac{1}{\cancel{2}} \times \frac{\cancel{2}}{1} m = -\left(\frac{1}{\cancel{2}} \times \frac{2}{1}\right) \\ m = -1 \end{array}$$

l. $3(r-1) = 6$

$$\begin{array}{r} 3r - \cancel{3} = 6 \\ \cancel{3} + 3 \\ \hline 3r = 9 \\ \frac{1}{\cancel{3}} \times \frac{\cancel{3}}{1} r = \frac{1}{\cancel{3}} \times \frac{3}{1} \\ r = 3 \end{array}$$

m. $3a - 2a = 5a$

$$\begin{array}{r} \cancel{3} \quad -2 \\ 3a = \cancel{3}a - 2 \\ -5a \quad -\cancel{5}a \\ \hline -2a = -2 \\ 2a = 2 \\ \frac{1}{\cancel{2}} \times \frac{\cancel{2}}{1} a = \frac{1}{\cancel{2}} \times \frac{1}{1} \\ a = 1 \end{array}$$

n. $5a - 4a = 2a + 5$

$$\begin{array}{r} \cancel{5} \quad +1 \\ 5a = \cancel{5}a + 6 \\ -2a \quad -\cancel{2}a \\ \hline 3a = 6 \\ \frac{1}{\cancel{3}} \times \frac{\cancel{3}}{1} a = \frac{1}{\cancel{3}} \times \frac{2}{1} \\ a = 2 \end{array}$$

o. $a^2 - a^2 = 17$

$$\begin{array}{r} \cancel{a^2} \quad -1 \\ a^2 = \cancel{a^2} + 6 \\ a = 4 \end{array}$$

p. $3b^2 = 12$

$$\frac{1}{\cancel{3}} \times \frac{\cancel{3}}{1} b^2 = \frac{1}{\cancel{3}} \times \frac{4}{1}$$

$$b^2 = 4$$

$$b = 2$$

q. $\sqrt{m} - \sqrt{m} = 3$

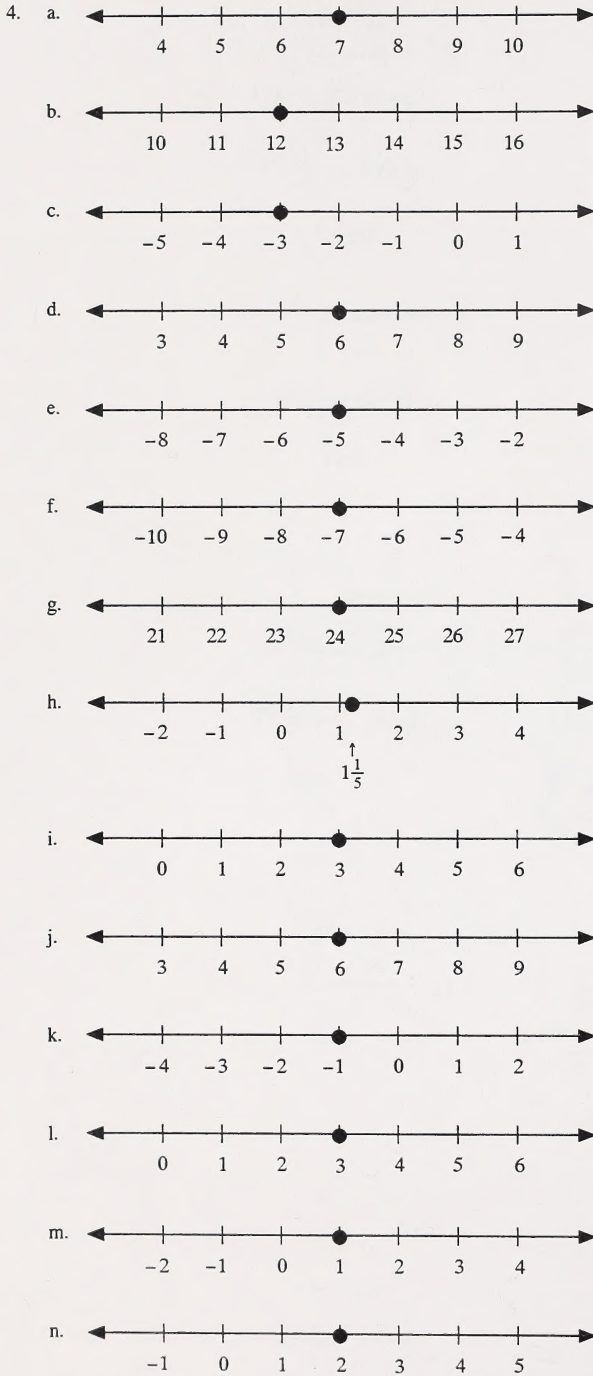
$$\begin{array}{r} \cancel{\sqrt{m}} \quad +1 \\ \sqrt{m} = 4 \\ m = 16 \end{array}$$

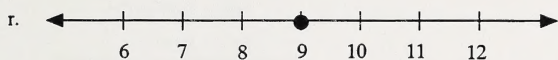
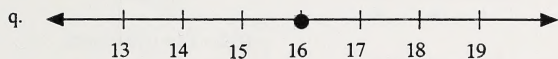
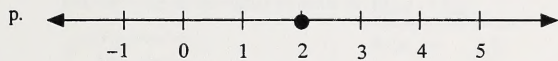
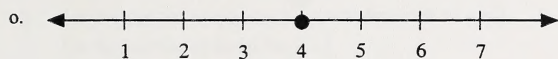
r. $2\sqrt{r} = 6$

$$\frac{1}{\cancel{2}} \times \frac{\cancel{2}}{1} \sqrt{r} = \frac{1}{\cancel{2}} \times \frac{3}{1}$$

$$\sqrt{r} = 3$$

$$r = 9$$



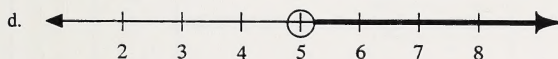
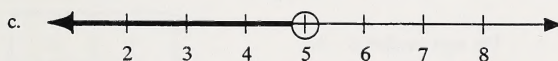
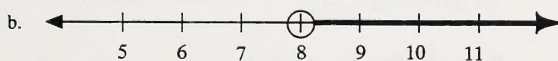
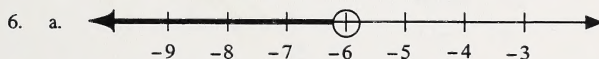


5. a. $a - 8 < 2$
 $\frac{-8}{-8} \quad -8$
 $a < -6$

b. $r - 5 > 3$
 $\frac{-5}{-5} \quad +5$
 $r > 8$

c. $2b < 10$
 $\frac{1}{2} \times \frac{1}{2} b < \frac{1}{2} \times \frac{5}{1} 10$
 $b < 5$

d. $3m > 15$
 $\frac{1}{3} \times \frac{1}{3} 3m > \frac{1}{3} \times \frac{5}{1} 15$
 $m > 5$



7. a. Let n be the number.

$$\begin{array}{r} n - 5 = 9 \\ +5 \\ \hline n = 14 \end{array}$$

The number is 14.

b. Let n be the number.

$$\begin{array}{r} 3n = 24 \\ \frac{1}{3} \times \frac{1}{3} 3n = \frac{1}{3} \times \frac{8}{1} 24 \\ n = 8 \end{array}$$

The number is 8.

- c. Let
- n
- be the number.

$$\begin{array}{r}
 5n - 4 = 19 \\
 \underline{-4 \quad -4} \\
 5n = 15 \\
 \frac{1}{5} \times \frac{1}{5}n = \frac{1}{5} \times \frac{3}{15} \\
 \frac{1}{1}n = 3
 \end{array}$$

The number is 3.

- d. Let
- n
- be the number.

$$\begin{array}{r}
 2n - 3 = n + 5 \\
 \underline{-3 \quad +3} \\
 2n = n + 8 \\
 \underline{-n \quad -n} \\
 n = 8
 \end{array}$$

The number is 8.

8. a. Let the amount Ryan spent be
- r
- .
-
- Let the amount Lu-Lin spent be
- $r - 5$
- .

$$\begin{array}{r}
 r + r - 5 = 17.96 \\
 2r - 5 = 17.96 \\
 \underline{-5 \quad +5} \\
 2r = 22.96 \\
 r = 11.48
 \end{array}$$

Ryan spent \$11.48.

$$\begin{aligned}
 \text{If } r = 11.48, \text{ then } r - 5 &= 11.48 - 5 \\
 &= 6.48
 \end{aligned}$$

Lu-Lin spent \$6.48.

- b. Let the first number be
- n
- .
-
- Let the next number be
- $n + 1$
- .

$$\begin{array}{r}
 n + n + 1 = -25 \\
 2n + 1 = -25 \\
 \underline{-1 \quad -1} \\
 2n = -26 \\
 n = -13
 \end{array}$$

The first number is -13 .

$$\begin{aligned}
 \text{If } n = -13, \text{ then } n + 1 &= -13 + 1 \\
 &= -12
 \end{aligned}$$

The next number is -12 .

9. Methods will vary. An algebraic method is shown, but students do not need to use algebra to solve the problems.

- a. Let Zoe's age be
- z
- .
-
- Let Jennifer's age be
- $3z$
- .
-
- Let Zoe's age six years ago be
- $z - 6$
- .
-
- Let Jennifer's age six years ago be
- $3z - 6$
- .

$$\begin{array}{r}
 z - 6 + 3z - 6 = 48 \\
 4z - 12 = 48 \\
 \underline{+12 \quad +12} \\
 4z = 60 \\
 \frac{1}{4} \times \frac{1}{4}z = \frac{1}{4} \times \frac{15}{60} \\
 \frac{1}{1}z = 15
 \end{array}$$

Zoe is 15 years old.

$$\begin{aligned}
 \text{If } z = 15, \text{ then } 3z &= 3 \times 15 \\
 &= 45
 \end{aligned}$$

Jennifer is 45 years old.

- b. Let the number of quarters be q .
 Let the number of dimes be $q + 1$.
 Let the value of the quarters in cents be $25q$.
 Let the value of the dimes in cents be $10(q + 1)$.

$$\$5 = 500c$$

$$25q + 10(q + 1) = 500$$

$$25q + 10q + 10 = 500$$

$$35q + 10 = 500$$

$$\begin{array}{r} 35q + 10 \\ -10 \quad -10 \\ \hline \end{array}$$

$$35q = 490$$

$$\frac{1}{35} \times \frac{1}{35} q = \frac{1}{35} \times \frac{14}{490}$$

$$q = 14$$

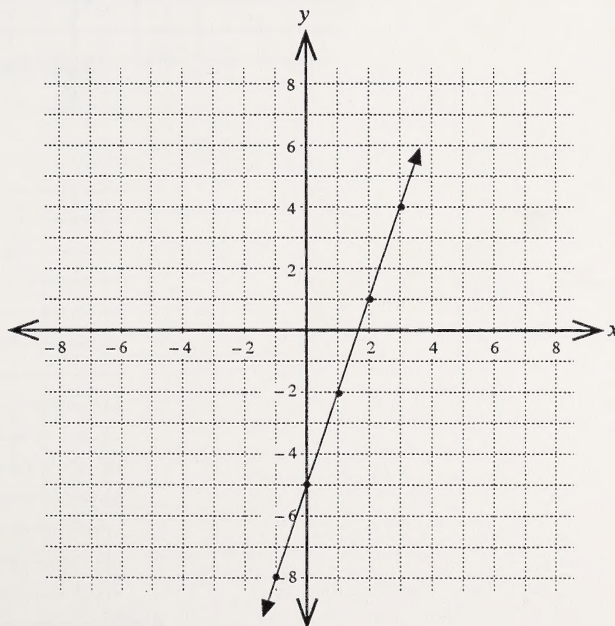
Jamil had 14 quarters.

$$\begin{aligned} \text{If } q = 14, \text{ then } q + 1 &= 14 + 1 \\ &= 15 \end{aligned}$$

Jamil had 15 dimes.

10. $y = 3x - 5$

x	y
3	4
2	1
1	-2
0	-5
-1	-8



11. a. $y + x = 2$

$$\begin{array}{r} \cancel{y} + \cancel{x} = 2 \\ \cancel{y} \quad -x \\ \hline y = -x + 2 \end{array}$$

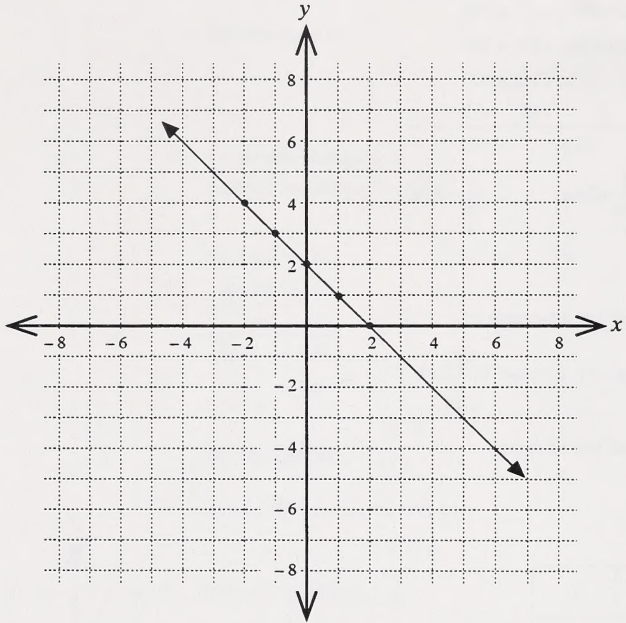
b. $3y = 2x$

$$\frac{1}{3} \times \frac{1}{3} y = \frac{1}{3} \times 2x$$

$$y = \frac{2}{3}x$$

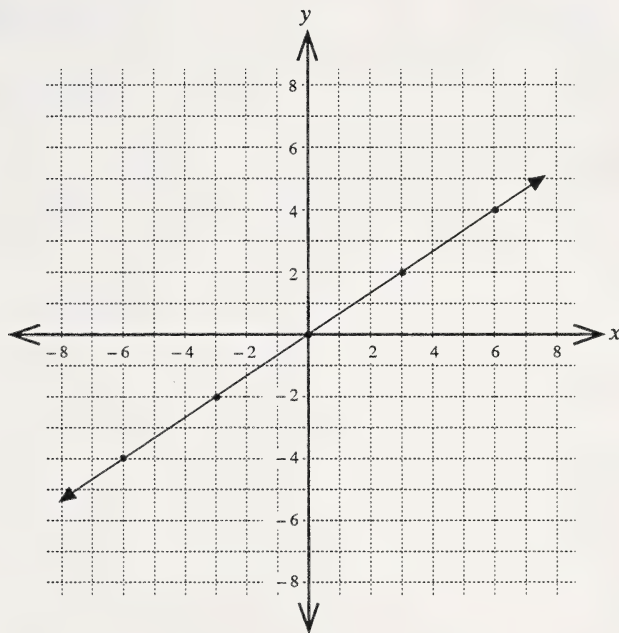
12. a. $y = -x + 2$

x	y
2	0
1	1
0	2
-1	3
-2	4



b. $y = \frac{2}{3}x$

x	y
6	4
3	2
0	0
-3	-2
-6	-4

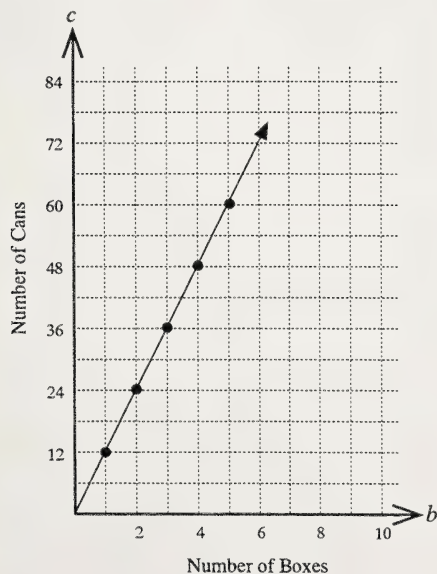


13. a. The number of cans equals 12 times the number of boxes.

b. $c = 12b$

c. $(1, 12), (2, 24), (3, 36), (4, 48), (5, 60)$

d.



14. a.

$b = \blacksquare a + 5$		
a	b	Pattern
1	7	} +2 } +2 } +2 }
2	9	
3	11	
4	13	

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} +2$$

$$b = 2a + 5$$

b.

$y = 3x - \blacksquare$		
x	y	Pattern } +3 } +3 } +3
1	-1	
2	2	
3	5	
4	8	

$$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} +3$$

$$y = 3x - 4$$

15. a.

$$\begin{aligned} b &= \frac{4(220 - a)}{5} \\ &= \frac{4(220 - 15)}{5} \\ &= \frac{4 \times 205}{5} \\ &= \frac{820}{5} \\ &= 164 \end{aligned}$$

The maximum number of heartbeats during exercise for 15-year olds is 164 beats per minute.

b.

$$\begin{aligned} b &= \frac{4(220 - a)}{5} \\ 144 &= \frac{4(220 - a)}{5} \\ \frac{5}{4} \times 144 &= \frac{5}{4} \times \frac{4(220 - a)}{5} \\ 180 &= 220 - a \\ -220 & \quad -220 \\ \hline -40 &= -a \\ 40 &= a \end{aligned}$$

A person with a maximum heartbeat of 144 beats per minute during exercise is 40 years old.

Note: It is recommended that students review the notes and do a few sample questions from the Practice Activities in the sections which correspond to the questions with which they experienced success.

It is recommended that students carefully study the notes and do most of the questions in the Practice Activities in the sections which correspond to the questions with which they experienced difficulties.

Questions	Skills	Sections
1	solving equations by inspection or the guess-check-revise method	2
2	solving inequations by inspection or the guess-check-revise method	3
3.a., b., c.	solving equations of the form $x + a = b$	4
3.d., e., f.	solving equations of the form $ax = b$	6
3.g., h.	solving equations of the form $\frac{x}{a} = b$ and $\frac{x}{a} = \frac{b}{c}$	8
3.i., j.	solving equations of the form $ax + bx = c$	10
3.k., l.	solving equations of the form $a(x + b) = c$	10
3.m., n.	solving equations of the forms $ax + b = cx$ and $ax + b = cx + d$	11
3.o., p.	solving equations of the forms $x^2 + a = b$ and $ax^2 = b$	12
3.q., r.	solving the equations of the forms $\sqrt{x} + a = b$ and $a\sqrt{x} = b$	12
4	graphing equations	1
5.a., b.	solving inequations of the form $x + a < b$ or $x + a > b$	4
5.c., d.	solving inequations of the form $ax < b$ or $ax > b$	6
6	graphing inequations	2
7	solving problems using equations	2, 4, 6, 8, 9
8, 9	solving problems using equations	10, 11, 13
10, 12	graphing equations	14
11	rearranging equations	14
13	describing relations	15
14	writing equations given ordered pairs	15
15	using formulas	15

Assignment Answer Key

Part 1: Short-Answer Questions

$$\begin{array}{r} 1. \quad a. \quad x + 5 = -2 \\ \quad \quad \quad \underline{-5 \quad -5} \\ \quad \quad \quad x \quad = -7 \end{array}$$

b. $3y = 12$

$$\frac{1}{\cancel{3}} \times \cancel{3}y = \frac{1}{\cancel{3}} \times \cancel{12}^4$$
$$1 \qquad \qquad 1$$
$$y = 4$$

c. $\frac{n}{2} = -3$
 $\cancel{2} \times \frac{n}{\cancel{2}} = 2 \times (-3)$
 $n = -6$

d. $\frac{n}{3} = \frac{1}{5}$
 $5n = 3$
 $n = \frac{3}{5}$

$$\begin{aligned} \text{e. } \frac{5}{s} &= \frac{2}{3} \\ 15 &= 2s \\ s &= \frac{15}{2} \text{ or } 7\frac{1}{2} \end{aligned}$$

$$\begin{array}{rcl} \text{f.} & 2x - 5 & = 11 \\ & \cancel{-5} \quad +5 & \\ \hline & 2x & = 16 \\ & x & = 8 \end{array}$$

$$\begin{aligned} \text{g. } 2r + 3r &= 20 \\ 5r &= 20 \\ \frac{1}{\cancel{5}} \times \frac{1}{\cancel{5}} r &= \frac{1}{\cancel{5}} \times \frac{4}{\cancel{20}} \\ r &= 4 \end{aligned}$$

$$\begin{aligned} \text{h. } 3b - 5b &= 8 \\ -2b &= 8 \\ 2b &= -8 \\ \frac{1}{\cancel{2}} \times \cancel{2}b &= \frac{1}{\cancel{2}} \times (-8) \\ b &= -4 \end{aligned}$$

$$\begin{array}{rcl} \text{i.} & 2(x-3) & = 10 \\ & 2x - 6 & = 10 \\ & \cancel{2x} + 6 & \\ \hline & 2x & = 16 \\ & x & = 8 \end{array}$$

$$\begin{array}{rcl} \text{j.} & 3(c+4) & = 15 \\ & 3c + 12 & = 15 \\ & \underline{-12} \quad \underline{-12} & \\ & 3c & = 3 \\ & \frac{1}{3} \times \frac{1}{3} c & = \frac{1}{3} \times \frac{1}{3} \\ & c & = 1 \end{array}$$

$$\begin{array}{r} \text{k.} \quad \cancel{3t} - 4 = 4t \\ \quad \quad \cancel{-3t} \quad \quad \quad \cancel{-3t} \\ \hline \quad \quad -4 = t \\ \quad \quad \quad t = -4 \end{array}$$

$$\begin{array}{r} 1. \quad \begin{array}{r} 2s - 7 = 5s + 2 \\ -2s \qquad -2s \\ \hline -7 = 3s + 2 \\ -2 \qquad -2 \\ \hline -9 = 3s \\ \frac{1}{3} \times (-9) = \frac{1}{3} \times 3s \\ -\left(\frac{1}{3} \times 3\right) = -\frac{1}{3} \times 3s \\ -3 = s \\ s = -3 \end{array} \end{array}$$

$$\begin{array}{r} \text{m. } a^2 + 2 = 11 \\ \quad -2 \quad -2 \\ \hline a^2 = 9 \\ a = 3 \end{array}$$

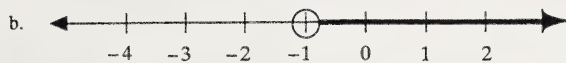
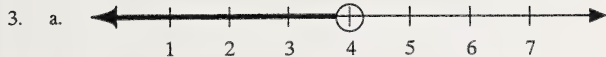
$$\begin{aligned} \text{n.} \quad & 3x^2 = 75 \\ & \frac{1}{3} \times \frac{1}{3} x^2 = \frac{1}{3} \times \frac{25}{1} \\ & x^2 = 25 \\ & x = 5 \end{aligned}$$

$$\begin{array}{r} \text{o. } \sqrt{t} - 1 = 3 \\ \quad \quad +1 \quad +1 \\ \hline \sqrt{t} = 4 \\ \quad t = 16 \end{array}$$

$$\begin{array}{rcl} 2. & a. & x + 7 < 11 \\ & & \underline{-7 \quad -7} \\ & & x < 4 \end{array}$$

$$\begin{array}{r} \text{b. } m - 2 > -3 \\ \quad +2 \quad +2 \\ \hline m > -1 \end{array}$$

$$\begin{aligned} \text{c.} \quad & 3v < -15 \\ & \frac{1}{3} \times 3v < \frac{1}{3} \times (-15) \\ & \cancel{\frac{1}{3}} \times \cancel{3}v < -\left(\cancel{\frac{1}{3}} \times \cancel{15}\right) \\ & v < -5 \end{aligned}$$



4. B

LS	RS
$9(4+x)$	18
$= 9[4+(-2)]$	
$= 9 \times 2$	
$= 18$	
LS	RS

LS = RS

Substituting -2 into the other equations will make statements that are not true.

A. $3(x-2) = 12$
 $3(2-2) = 12$
 $3(0) = 12$
 $0 = 12$

(untrue)

C. $\frac{x}{12} = 6$
 $\frac{-2}{12} = 6$
 $-\frac{1}{6} = 6$

(untrue)

D. $24 + 5x = -34$
 $24 + 5(-2) = -34$
 $24 - 10 = -34$
 $14 = -34$

(untrue)

5. C

LS	RS
$x-1$	5
$= 4-1$	
$= 3$	
LS	RS

LS < RS

Substituting 4 into the other inequations will make statements that are not true.

A. $x+2 > 6$
 $4+2 > 6$
 $6 > 6$

(untrue)

B. $4t > 16$
 $4(4) > 16$
 $16 > 16$

(untrue)

D. $2n < 7$
 $2(4) < 7$
 $8 < 7$

(untrue)

6. B	LS	RS
	y	$-x + 4$
	3	$= -1 \times 1 + 4$
		$= -1 + 4$
		$= 3$
	LS	= RS

Substituting $(1, 3)$ into the other equations will make statements that are not true.

A. $y = 3x + 2$
 $3 = 3(1) + 2$
 $3 = 3 + 2$
 $3 = 5$
 (untrue)

C. $y = x + 3$
 $3 = 1 + 3$
 $3 = 4$
 (untrue)

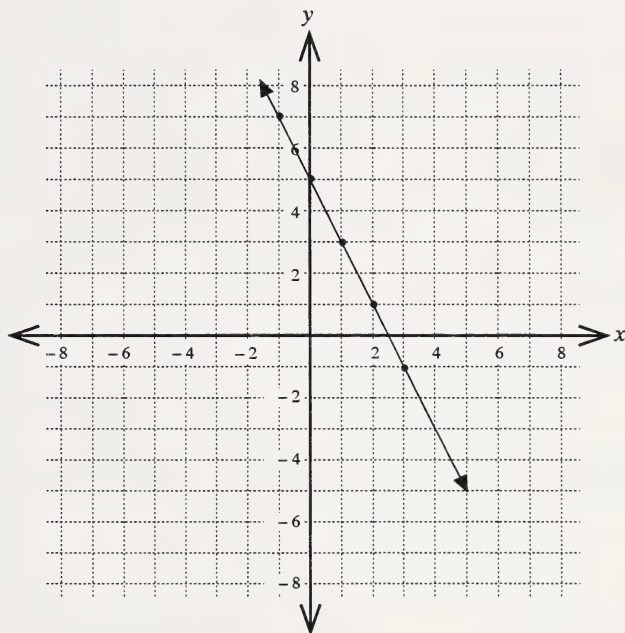
D. $y = 3x + 1$
 $3 = 3(1) + 1$
 $3 = 3 + 1$
 $3 = 4$
 (untrue)

7. a. $\cancel{x} - y = 3$
 $\cancel{-x} \quad -x$
 $-y = -x + 3$
 $y = x - 3$

b. $3y \cancel{+x} = 6$
 $\cancel{-x} \quad -x$
 $3y = -x + 6$
 $\frac{3y}{3} = \frac{-x}{3} + \frac{6}{3}$
 $y = \frac{-x}{3} + 2$

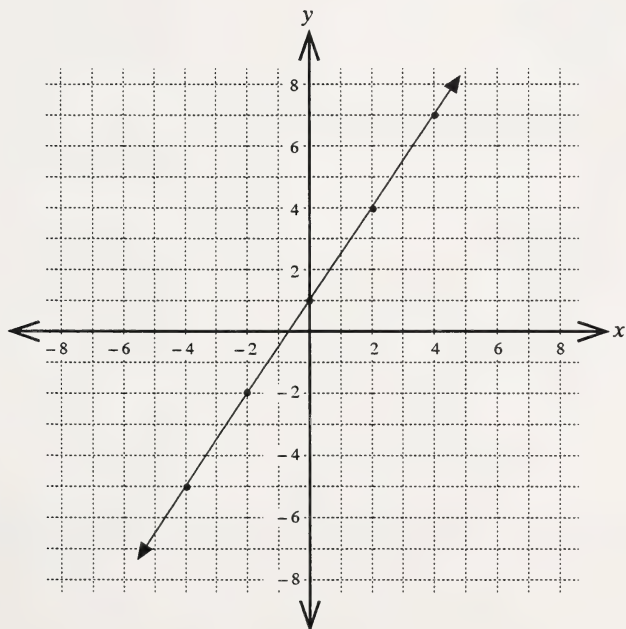
8. a. $y = -2x + 5$

x	y
-1	7
0	5
1	3
2	1
3	-1



b. $y = \frac{3}{2}x + 1$

x	y
4	7
2	4
0	1
-2	-2
-4	-5



9. a. $y = 2x + 3$
- b. $y = x + 5$
10. a. $\ell = 9.2 + 0.17m$
 $= 9.2 + 0.17 \times 25$
 $= 9.2 + 4.25$
 $= 13.45$

The length of the rubber band is 13.45 cm.

b. **Method 1**

$$\begin{array}{rcl} \ell & = & 9.2 + 0.17m \\ 18.7 & = & 9.2 + 0.17m \\ -9.2 & -9.2 & \\ \hline 9.5 & = & 0.17m \\ m & \doteq & 55.9 \end{array}$$

Method 2

$$\begin{array}{rcl} \ell & = & 9.2 + 0.17m \\ \ell - 9.2 & = & 0.17m \\ \frac{\ell - 9.2}{0.17} & = & \frac{0.17m}{0.17} \\ \frac{\ell - 9.2}{0.17} & = & m \end{array}$$

$$\begin{array}{rcl} m & = & \frac{\ell - 9.2}{0.17} \\ m & = & \frac{18.7 - 9.2}{0.17} \\ m & = & \frac{9.5}{0.17} \\ m & \doteq & 55.9 \end{array}$$

A mass of about 55.9 g will stretch the rubber band to 18.7 cm.

11. a. $d = 3.56\sqrt{a}$
 $= 3.56\sqrt{5000}$
 $\doteq 3.56 \times 70.7$
 $\doteq 251.730$

Vaughn can see about 251.730 km at this altitude.

b. **Method 1**

$$\begin{array}{rcl} d & = & 3.56\sqrt{a} \\ 200 & = & 3.56\sqrt{a} \\ \frac{200}{3.56} & = & \frac{3.56\sqrt{a}}{3.56} \\ \sqrt{a} & \doteq & 56.180 \\ a & \doteq & 3156 \end{array}$$

Method 2

$$\begin{array}{rcl} d & = & 3.56\sqrt{a} \\ \frac{d}{3.56} & = & \frac{3.56\sqrt{a}}{3.56} \\ \frac{d}{3.56} & = & \sqrt{a} \\ \left(\frac{d}{3.56}\right)^2 & = & (\sqrt{a})^2 \\ \frac{d^2}{12.67} & = & a \end{array}$$

$$\begin{array}{rcl} a & = & \frac{d^2}{12.67} \\ a & = & \frac{200^2}{12.67} \\ a & = & \frac{40\,000}{12.67} \\ a & \doteq & 3157 \end{array}$$

If Vaughn flies at an altitude of about 3156 or 3157 m, he'll be able to see this distance.

12. Let n be the number.

$$3n - 2 = 2n + 5$$

Part 2: Problems

An algebraic solution is shown in each case, but students may solve by other methods.

1. Let the price of the lot be n .
Then the price of the house is $3n$.

$$n + 3n = 80\,000$$

$$4n = 80\,000$$

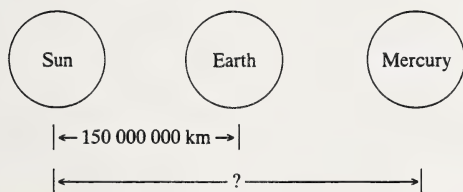
$$n = 20\,000$$

The lot cost \$20 000.

$$\begin{aligned}\text{If } n = 20\,000, \text{ then } 3n &= 3 \times 20\,000 \\ &= 60\,000\end{aligned}$$

The price of the house is \$60 000.

2. Students may use objects or diagrams. Students may simplify the problem first.



Let the distance from Mercury to the sun be x .

$$\begin{array}{rcl} 3x - 24\,000\,000 & = & 150\,000\,000 \\ + 24\,000\,000 & + & 24\,000\,000 \\ \hline 3x & = & 174\,000\,000 \\ \frac{1}{3} \times \frac{1}{3}x & = & \frac{1}{3} \times 174\,000\,000 \\ x & = & 58\,000\,000 \end{array}$$

It is 58 000 000 km from Mercury to the sun.

3. Let n be the number of children.

$$5(n + 6) = 95$$

$$5n + \cancel{30} = 95$$

$$\underline{ \cancel{30} - 30}$$

$$5n = 65$$

$$n = 13$$

The old woman had 13 children.

4. Let n be the number of tickets sold last year.
Then $2n$ is the number of advance tickets sold this year.

$$2n + \cancel{235} = 825$$

$$\underline{ \cancel{235} - 235}$$

$$2n = 590$$

$$n = 295$$

The number of tickets sold last year was 295.

5. Let n be the amount of Gaylord's money.
Then $2n$ is the amount of Krish's money.
Then $2n + 25$ is the amount of Denzil's money.

$$n + 2n + 2n + 25 = 295$$

$$5n + \cancel{25} = 295$$

$$\underline{ \cancel{25} - 25}$$

$$5n = 270$$

$$n = 54$$

Gaylord has \$54.

$$\begin{aligned} \text{If } n = 54, \text{ then } 2n &= 2 \times 54 \\ &= 108 \end{aligned}$$

Krish has \$108.

$$\begin{aligned} \text{If } n = 54, \text{ then } 2n + 25 &= 2 \times 54 + 25 \\ &= 108 + 25 \\ &= 133 \end{aligned}$$

Denzil has \$133.

6.

Candy	Number	Individual Cost	Total Cost
Jawbreakers	n	5	$5n$
Licorice	$n + 5$	8	$8(n + 5)$

$$5n + 8(n + 5) = 170$$

$$5n + 8n + 40 = 170$$

$$13n + 40 = 170$$

$$\begin{array}{r} 13n + 40 = 170 \\ -40 \quad -40 \\ \hline 13n = 130 \end{array}$$

$$13n = 130$$

$$n = 10$$

Jamel bought 10 jawbreakers.

$$\begin{aligned} \text{If } n = 10, \text{ then } n + 5 &= 10 + 5 \\ &= 15 \end{aligned}$$

Jamel bought 15 licorice.

7.

	Now	In Eight Years
Brad's age	$n + 9$	$n + 17$
Joan's age	n	$n + 8$

$$6 \times (n + 17) = 7 \times (n + 8)$$

$$6n + 102 = 7n + 56$$

$$\begin{array}{r} 6n + 102 = 7n + 56 \\ -6n \quad -6n \\ \hline 102 = n + 56 \end{array}$$

$$102 = n + 56$$

$$\begin{array}{r} 102 = n + 56 \\ -56 \quad -56 \\ \hline 46 = n \end{array}$$

$$46 = n$$

Joan is 46 years old.

$$\begin{aligned} \text{If } n = 46, \text{ then } n + 9 &= 46 + 9 \\ &= 55 \end{aligned}$$

Brad is 55 years old.

Module 5: Ratio and Proportion

Gathering Materials

For this module the student will need the following items available from the Learning Resources Distributing Centre.

- Student Module 5: Ratio and Proportion
- Assignment Booklet for Module 5
- optional course audiocassette for Module 5
- required videocassettes for Module 5 (*MATH MOVES: Percents, SOLVE IT: Scale Drawings and Models*)

Students may use the following computer programs if they have access to them and an Apple™ or compatible computer.

- *Computer Drill and Instruction: Mathematics, Level D (SRA)*

In addition, the students will need a binder and loose-leaf paper for their responses, a scientific calculator with a $\frac{a}{b}$ key, and a geometry set.

Hold the Assignment Booklet for safekeeping until the student is ready for it.

Guiding the Student

Each section of Module 5 deals with a different aspect of ratio and proportion. Parts of Sections 2, 3, 4, 5, 7, 8, and 9 review previously developed skills. The Pretest in Section 1 will help you discover the student's strengths and weaknesses and make a personal study plan.

Ensure that the student reads the welcome pages and the module introduction, and does Section 1. Then check the answers to the Pretest (suggested answers follow). Help the student develop a personal study plan and schedule. An average student spends about seven weeks of a 40-week school year on Module 5.

Use the guidelines provided at the beginning of this guide to monitor the student's progress and provide encouragement.

Refer to the suggested answers in the Appendix of Student Module 5: Ratio and Proportion when guiding the student through the Practice Activities in Module 5.

Section 1: Pretest

- The ratio of the number of nickels to the number of pennies is 3:5.
 - The ratio of the value of the nickels in cents to the value of pennies in cents is $\frac{15}{5}$ or $\frac{3}{1}$.
 - The ratio of the value of the nickels in cents to the total value in cents is 0.75.

2. Restaurant A

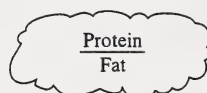
$$\frac{29}{32} \div 0.9$$

$$0.9 > 0.8$$



Restaurant B

$$\frac{26}{31} \div 0.8$$

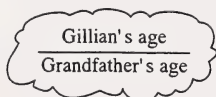


So, Restaurant A's hamburgers have the greater ratio of protein to fat.

$$3. \quad \frac{2}{7} = \frac{22}{n}$$

$$2n = 154$$

$$n = 77$$



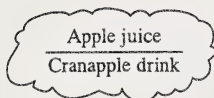
The grandfather is 77 years old.

4. $3 + 2 = 5$

$$\frac{2}{5} = \frac{n}{700}$$

$$1400 = 5n$$

$$280 = n$$



To make the cranapple drink, 280 mL of apple juice is used.

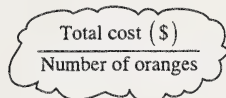
5. a. 99 words : 4 min

b. $\frac{49 \text{ tires}}{7 \text{ h}}$ or 7 tires/h

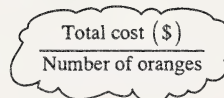
6. Francena

Zoe

$$\frac{3.99}{12} = \frac{0.33}{1}$$



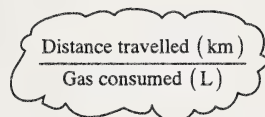
$$\frac{2.49}{8} = \frac{0.31}{1}$$



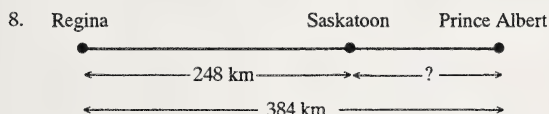
$$\$0.31/\text{orange} < \$0.33/\text{orange}$$

So, Zoe received the better deal.

7.
$$\frac{416}{40} = \frac{x}{15}$$
$$40x = 6240$$
$$x = 156$$



The car can travel 156 km on 15 L of fuel.



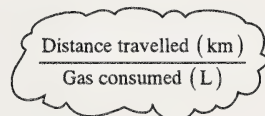
$$384 - 248 = 136$$

It is 136 km from Saskatoon to Prince Albert.

$$\frac{248}{60} = \frac{136}{x}$$

$$248x = 8160$$

$$x = 32.9$$



The car will consume about 32.9 L travelling from Saskatoon to Prince Albert.

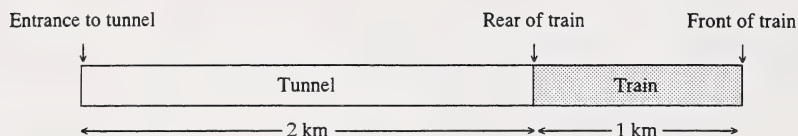
$$85 - 60 = 25$$

After travelling from Regina to Saskatoon, Krish Naidu has 25 L of gasoline left.

$$25 < 32.9$$

So, he cannot complete the trip to Prince Albert without refuelling.

9. Train Leaving Tunnel



The train travels 3 km before the rear of the train emerges from the tunnel.

$$d = v \times t$$

$$3 = 30 \times t$$

$$t = \frac{3}{30}$$

$$= \frac{1}{10}$$

$$1 \text{ h} = 60 \text{ min}$$

$$\frac{1}{10} \text{ h} = 6 \text{ min}$$

The train takes $\frac{1}{10}$ h, or 6 min, to travel 3 km.

So, the rear of the train emerges from the tunnel at 1:06 p.m.

10. a. $28 + 13 + 23 + 15 = 79$
 $100 - 79 = 21$

There are 21 red stars.

Blue stars

$$\frac{28}{100} = 28\%$$

Gold stars

$$\frac{13}{100} = 13\%$$

Green stars

$$\frac{23}{100} = 23\%$$

Silver stars

$$\frac{15}{100} = 15\%$$

Red stars

$$\frac{21}{100} = 21\%$$

b. $\frac{13}{23} = \frac{x}{100}$
 $1300 = 23x$
 $56.5 \div x$

$$\frac{\text{Gold stars}}{\text{Green stars}}$$

The number of gold stars is about 56.5% of the number of green stars.

c. $\frac{28}{15} = \frac{x}{100}$
 $2800 = 15x$
 $186.7 \div x$

$$\frac{\text{Gold stars}}{\text{Green stars}}$$

The number of blue stars is about 186.7% of the number of silver stars.

$$\begin{aligned} 11. \quad a. \quad 45\% &= \frac{45}{100} \\ &= 0.45 \end{aligned}$$

$$\begin{aligned} 45\% &= \frac{45}{100} \\ &= \frac{9}{20} \end{aligned}$$

$$\begin{aligned} b. \quad 9\% &= \frac{9}{100} \\ &= 0.09 \end{aligned}$$

$$9\% = \frac{9}{100}$$

$$\begin{aligned} c. \quad 12.5\% &= \frac{12.5}{100} \\ &= \frac{125}{1000} \\ &= 0.125 \end{aligned}$$

$$\begin{aligned} 12.5\% &= \frac{12.5}{100} \\ &= \frac{125}{1000} \\ &= \frac{1}{8} \end{aligned}$$

$$\begin{aligned} d. \quad 160\% &= \frac{160}{100} \\ &= 1.6 \end{aligned}$$

$$\begin{aligned} 160\% &= \frac{160}{100} \\ &= \frac{16}{10} \\ &= 1\frac{6}{10} \\ &= 1\frac{3}{5} \end{aligned}$$

$$\begin{aligned} e. \quad 137\frac{1}{2}\% &= 137.5\% \\ &= \frac{137.5}{100} \\ &= 1.375 \end{aligned}$$

$$\begin{aligned} 137\frac{1}{2}\% &= \frac{275}{2}\% \\ &= \frac{\frac{275}{2}}{100} \\ &= \frac{275}{2} \div 100 \\ &= \frac{275}{2} \times \frac{1}{100} \\ &= \frac{275}{200} \\ &= 1\frac{75}{200} \\ &= 1\frac{3}{8} \end{aligned}$$

$$\begin{aligned} 12. \quad a. \quad 0.35 &= \frac{35}{100} \\ &= 35\% \end{aligned}$$

$$\begin{aligned} b. \quad 0.7 &= \frac{7}{10} \\ &= \frac{70}{100} \\ &= 70\% \end{aligned}$$

$$\begin{aligned} c. \quad 1.62 &= \frac{162}{100} \\ &= 162\% \end{aligned}$$

$$\begin{aligned} d. \quad 4.2 &= \frac{42}{10} \\ &= \frac{420}{100} \\ &= 420\% \end{aligned}$$

$$13. \quad a. \quad \frac{23}{100} = 23\%$$

$$\begin{aligned} b. \quad \frac{3}{10} &= \frac{30}{100} \\ &= 30\% \end{aligned}$$

$$\begin{aligned} c. \quad 2\frac{3}{20} &= \frac{43}{20} \\ &= \frac{215}{100} \\ &= 215\% \end{aligned}$$

$$\begin{aligned} d. \quad 1\frac{7}{25} &= \frac{32}{25} \\ &= \frac{128}{100} \\ &= 128\% \end{aligned}$$

14. $30\% \text{ of } 80 = 0.3 \times 80$ or $\frac{30}{100} = \frac{x}{80}$
 $= 24$
 $2400 = 100x$
 $24 = x$

She won 24 races.

She won 24 races.

15. $20\% \text{ of the races is } 30.$ or $\frac{20}{100} = \frac{30}{x}$
 $\downarrow \quad \downarrow \quad \downarrow \downarrow$
 $0.2 \quad r \quad = 30$
 $20x = 3000$
 $x = 150$
 $r = 150$

The swimmer entered 150 races.

The swimmer entered 150 races.

16. What percent of 80 is 30?
 $\downarrow \quad \downarrow \downarrow \downarrow$
 $\frac{x}{100} \times 80 = 30$ or $\frac{x}{100} = \frac{30}{80}$
 $\frac{80x}{100} = 30$
 $80x = 3000$
 $x = 37.5$
 $\frac{4x}{5} = 30$
 $\frac{1}{5} \times \frac{1}{1} \times \frac{4x}{1} = \frac{5}{4} \times \frac{15}{30}$
 $x = 37.5$

The baseball team won 37.5% of the games.

The baseball team won 37.5% of the games.

17. $25\% \text{ of } 45.98 = 0.25 \times 45.98$ or $100\% - 25\% = 75\%$
 $= 11.50$
 $45.98 - 11.50 = 34.48$
 $75\% \text{ of } 45.98 = 0.75 \times 45.98$
 $= 34.49$

The sale price is \$34.48.

The sale price is \$34.49.

18. $7\% \text{ of } 39.99 = 0.07 \times 39.99$ or $100\% + 7\% = 107\%$
 $= 2.80$
 $39.99 + 2.80 = 42.79$
 $107\% \text{ of } 39.99 = 1.07 \times 39.99$
 $= 42.79$

The final price is \$42.79.

The final price is \$42.79.

19. Estimates may vary. Exact answers are given.

a. 40.8 b. 2.2 c. $203\frac{1}{3}$ d. 497.5 e. 88.825

20. Methods for finding the answers will vary. The steps to compute mentally are not necessarily the same as the step to compute using paper and pencil.

a. 0.64 b. 24 c. 30 d. 44

21. a. $I = Prt$
 $= 1250 \times 0.08 \times 2$
 $= 200$

b. $I = Prt$
 $= 800 \times 0.12 \times 0.5$
 $= 48$

6 mo = 0.5 a

The interest is \$200.

The interest is \$48.

c. $I = Prt$
 $= 3600 \times 0.21 \times 2$
 $= 1512$

$1\frac{3}{4}\% / \text{mo} = 21\% / \text{a}$

The interest is \$1512.

22. $\frac{1}{4} = \frac{4.8}{x}$
 $x = 19.2$

Scale drawing (cm)
 Actual (m)

The actual length of the store is 19.2 m.

Note: It is recommended that students review the notes and do a few sample questions from the Practice Activities in the sections which correspond to the questions with which they experienced success.

It is recommended that students carefully study the notes and do most of the questions in the Practice Activities in the sections which correspond to the questions with which they experienced difficulties.

Questions	Skills	Sections
1	writing ratios	2
2	comparing ratios	2
3, 4	solving ratio problems	3
5	writing rates	4
6	comparing rates	4
7, 8	solving rate problems	5
9	solving more rate problems	6
10	writing percents	7
11	expressing percents as decimal numbers and fractions	7
12	expressing a decimal number as a percent	7
13	expressing a fraction as a percent	7

Questions	Skills	Sections
14, 15, 16, 17, 18	solving percent problems	8
19	estimating a percent of a number	9
20	mentally computing a percent of a number	9
21	calculating interest	10
22	interpreting scale drawings	11

Assignment Answer Key

Part 1: Ratios

1. a. 1 to 3 b. 1 to 4 c. 3 to 4

2. $\frac{25}{16} = \frac{x}{320}$
 $8000 = 16x$
 $500 = x$

Pancake mix
Water

So, 500 mL of pancake mix is required.

3. Methods may vary. An algebraic solution is shown.

$$3 + 8 = 11$$

$$\frac{3}{11} = \frac{x}{99}$$

$$297 = 11x$$

$$27 = x$$

$$\frac{8}{11} = \frac{y}{99}$$

$$792 = 11y$$

$$72 = y$$

The numbers are 27 and 72.

4. Methods may vary. One method is shown.

a. $3 + 2 = 5$; $4 + 5 = 9$

Guppies in both aquariums
Neon tetras in both aquariums

$$\frac{5}{9}$$

$$\frac{5}{9} = \frac{25}{x}$$

$$5x = 225$$

$$x = 45$$

There are 45 neon tetras altogether.

b. $3 + 2 = 5$

Guppies in aquarium 1
Total guppies

$$\frac{3}{5}$$

$$\frac{3}{5} = \frac{y}{25}$$

$$75 = 5y$$

$$15 = y$$

There are 15 guppies in the first aquarium.

$$25 - 15 = 10$$

There are 10 guppies in the second aquarium.

$$5. \quad \frac{7}{3} = \frac{x}{10}$$

$$3x = 70$$

$$x = 23.3$$

About 23.3 L of antifreeze should be mixed with 10 L of water.

$$6. \quad \frac{90}{240} = 0.375 \qquad \frac{63}{180} = 0.35$$

$$0.375 > 0.35$$

$$\text{So, } \frac{90}{240} > \frac{63}{180}.$$

Orville Orbit had the better batting average.

$$7. \quad \text{a. } 2 \times 90 = 180$$

180 slices of unburned toast are required.

If 1 out of 5 slices are burned, 4 out of 5 are not burned.

$$\frac{4}{5} = \frac{180}{x}$$

$$4x = 900$$

$$x = 225$$

If 1 out of every 5 slices of toast burns, 225 slices must be toasted to obtain 180 unburned slices.

$$\text{b. } 17 - 2 = 15$$

$$\frac{15}{17} = \frac{225}{n}$$

$$15n = 3825$$

$$n = 255$$

If the end slices out of every loaf are not used, 255 slices are required to obtain 180 unburned slices.

$$255 \div 17 = 15$$

So, 15 loaves of bread are needed.

Part 2: Rates

$$1. \quad \text{a. } 104\,000 \text{ visitors} / 4 \text{ d} = 26\,000 \text{ visitors/d}$$

$$\text{b. } \$9.60 / 1\frac{1}{2} \text{ dozen} = \$6.40 / \text{dozen or about } \$0.53 / \text{apple}$$

2.

$$\frac{\text{Blocks walked}}{\text{Time (min)}}$$

$$\frac{10}{25}$$

$$\frac{10}{25} = \frac{x}{40}$$

$$400 = 25x$$

$$16 = x$$

June can walk 16 blocks in 40 min.

3. Methods may vary. One method is shown.

$$\frac{2.99}{390} = \frac{x}{100}$$

$$299 = 390x$$

$$0.77 \div x$$

So, the rate is about \$0.77/100 g.

$$\frac{2.89}{380} = \frac{x}{100}$$

$$289 = 380x$$

$$0.76 \div x$$

So, the rate is about \$0.76/100 g.

$$\frac{0.79}{100}$$

So, the rate is \$0.79/100 g.

Therefore, the best buy is 380 g for \$2.89.

4.



Two cuts are required to saw a log into three pieces.

$$\frac{2}{4} = \frac{1}{2}$$

$$\frac{\text{Cuts}}{\text{Time (min)}}$$

The rate is 1 cut/2 min.



Three cuts are required to saw a similar log into four pieces.

$$\frac{1}{2} = \frac{3}{x}$$

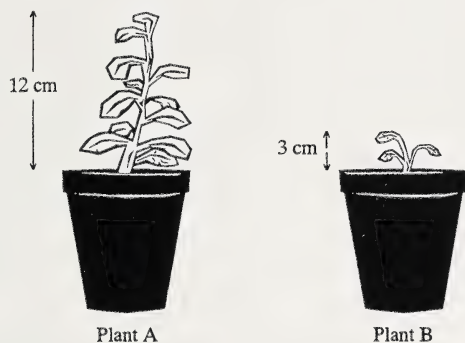
$$\frac{\text{Cuts}}{\text{Time (min)}}$$

$$x = 6$$

It takes 6 min to cut a similar log into four pieces.

5. Methods will vary. Two methods are shown.

Method 1



Weeks	Plant A	Plant B
1	14 cm	8 cm
2	16 cm	13 cm
3	18 cm	18 cm

It will be 3 weeks before both plants are the same height.

Method 2

Let x be the number of weeks before both plants are the same height.

Let $2x$ be the growth of the first plant.

Let $5x$ be the growth of the second plant.

$$\begin{array}{rcl}
 12 + 2x & = & 3 + 5x \\
 -2x & & -2x \\
 \hline
 12 & = & 3 + 3x \\
 -3 & & -3 \\
 \hline
 9 & = & 3x \\
 3 & = & x
 \end{array}$$

It will be 3 weeks before both plants are the same height.

6. a. $d = vt$
 $5 = 50 \times t$
 $\frac{5}{50} = \frac{50 \times t}{50}$
 $\frac{1}{10} = t$

1 h = 60 min
 $\frac{1}{10}$ h = 6 min

It takes $\frac{1}{10}$ h, or 6 min, to go the first 5 km.

b. $10 - 6 = 4$

You have 4 min remaining to get to the airport.

$d = vt$
 $5 = v \times \frac{1}{15}$
 $v = 75$

1 h = 60 min
 4 min = $\frac{4}{60}$ or $\frac{1}{15}$ h

You must travel an average of 75 km/h for the next 5 km to get to the airport on time.

Part 3: Percents

1. a. $87\frac{1}{2}\% = 87.5\%$
 $= \frac{87.5}{100}$
 $= 0.875$

$87\frac{1}{2}\% = \frac{175}{2}\%$
 $= \frac{175}{2} \times \frac{1}{100}$
 $= \frac{175}{200}$
 $= \frac{7}{8}$

b. $75\% = \frac{75}{100}$
 $= 0.75$

$75\% = \frac{75}{100}$
 $= \frac{3}{4}$

c. $162.5\% = \frac{162.5}{100}$
 $= 1.625$

$162.5\% = \frac{162.5}{100}$
 $= \frac{1625}{1000}$
 $= 1\frac{625}{1000}$
 $= 1\frac{5}{8}$

d. $16\frac{2}{3}\% = 16.\dot{6}\%$
 $= \frac{16.\dot{6}}{100}$
 $= 0.1\dot{6}$

$16\frac{2}{3}\% = \frac{50}{3}\%$
 $= \frac{50}{3} \times \frac{1}{100}$
 $= \frac{50}{300}$
 $= \frac{1}{6}$

2. Methods may vary. One method is shown.

$12\% \text{ of } 120 = 0.12 \times 120$
 $= 14.4$

About 14 of the 120 students had part-time jobs.

3. Methods may vary. One method is shown.

$$\frac{6}{400} = \frac{x}{100}$$

$$600 = 400x$$

$$\frac{6}{4} = x$$

$$\frac{3}{2} = x$$

$$1\frac{1}{2} = x$$

$1\frac{1}{2}\%$ of the drivers were impaired.

4. Methods may vary. One method is shown.

75% of what number is 60 000?

$$0.75x = 60\,000$$

$$x = \frac{60\,000}{0.75}$$

$$x = 80\,000$$

The appraised value is \$80 000.

5. Methods may vary. One method is shown.

$$\begin{aligned} \text{a. } 80\% \text{ of } 320 &= 0.8 \times 320 \\ &= 256 \end{aligned}$$

The sale price is \$256.

$$\begin{aligned} \text{b. } 107\% \text{ of } 256 &= 1.07 \times 256 \\ &= 273.92 \end{aligned}$$

The final price with GST is \$273.92.

$$\begin{aligned} \text{6. a. } I &= Prt \\ &= 3500 \times 0.09 \times 5 \\ &= 1575 \end{aligned}$$

The interest is \$1575.

$$\begin{aligned} \text{b. } I &= Prt \\ &= 4000 \times 0.1125 \times 0.5 \\ &= 225 \end{aligned}$$

The interest is \$225.

7. Methods may vary. One method is shown.

Let the amount interest at 7% be x .

Let the amount invested at 6% be $3800 - x$

$$0.07x + 0.06(3800 - x) = 240$$

$$0.07x + 228 - 0.06x = 240$$

$$0.01x + 228 = 240$$

$$\begin{array}{r} -228 \\ 0.01x + 228 = 240 \\ \hline 0.01x = 12 \end{array}$$

$$0.01x = 12$$

$$x = 1200$$

Mr. Lee invested \$1200 at 7%.

$$3800 - x = 3800 - 1200$$

$$= 2600$$

Mr. Lee invested \$2600 at 6%.

Part 4: Scale Drawings

1. Draw a grid on the original.



The original drawing is 9 cm by 9 cm. Calculate the size of the enlargement.

$$\begin{aligned} 200\% \text{ of } 9 &= 2 \times 9 \\ &= 18 \end{aligned}$$

The enlargement will be 18 cm by 18 cm.

Draw a box that is 18 cm by 18 cm and lightly draw the lines of a grid that corresponds to the original. Copy the picture from each square of the original grid to the corresponding square on the enlarged grid. Erase the grid lines.



b. $130\% \text{ of } 9 = 1.3 \times 9$
 $= 11.7$

The dimensions of the enlargement would be 11.7 cm by 11.7 cm.

2. a. 4.5 cm represents 5000 km.

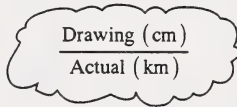
$$\frac{4.5}{5000} = \frac{1}{x}$$

$$4.5x = 5000$$

$$x = 1111.1$$

1 cm represents about 1111.1 km.

b. $\frac{1}{1111.1} = \frac{4}{x}$
 $x = 4444.4$



$$\frac{\text{Drawing (cm)}}{\text{Actual (km)}}$$

The distance from the northern tip of Brazil to the southern tip of Brazil is 4444.4 km.

Module 6: Measurement and Geometry

Gathering Materials

For this module the student will need the following items available from the Learning Resources Distributing Centre.

- Student Module 6: Measurement and Geometry
- Assignment Booklet for Module 6
- optional course audiocassette for Module 6
- required videocassettes for Module 6 (*MATHWAYS: Areas*, *MATHWAYS: Volumes*)

Students may wish to view the following program if they have access to it.

- Geometric Constructions (International Telecommunications Inc.)

Students may use the following computer programs if they have access to them and an Apple™ or compatible computer.

- *Geometric Concepts: Perimeter* (Jostens Learning Systems)
- *Geometric Concepts: Area* (Jostens Learning Systems)

In addition, the students will need a binder and loose-leaf paper for their responses, tracing paper, heavy paper or light cardboard, glue, a scientific calculator with a $\frac{a}{b}$ key, and a geometry set (straight edge, ruler, protractor, compass).

Hold the Assignment Booklet for safekeeping until the student is ready for it.

Guiding the Student

Each section of Module 6 deals with a different aspect of measurement and geometry. Parts of Sections 8, 9, and 11 review previously developed skills. The review in Section 1 will review other previously developed skills. The pretest in Section 1 will help you discover the student's strengths and weaknesses and make a personal study plan.

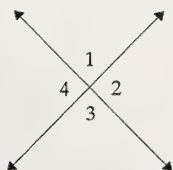
Ensure that the student reads the welcome pages and the module introduction, and does Section 1. Then check the answers to the Pretest (suggested answers follow). Help the student develop a personal study plan and schedule. An average student spends about seven weeks of a 40-week school year on Module 6.

Use the guidelines provided at the beginning of this guide to monitor the student's progress and provide encouragement.

Suggested Answers

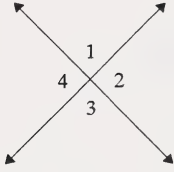
Section 1: Pretest

- Complementary angles are two angles with a combined measure of 90° .
 - Supplementary angles are two angles with a combined measure of 180° .
 - Adjacent angles of intersecting lines are the two angles that share a common vertex and a common ray.



- $\angle 1$ and $\angle 2$ are adjacent angles.
- $\angle 1$ and $\angle 4$ are adjacent angles.
- $\angle 2$ and $\angle 3$ are adjacent angles.
- $\angle 3$ and $\angle 4$ are adjacent angles.

- d. Opposite angles of intersecting lines are the pair of non-adjacent angles formed by the intersecting lines.



$\angle 1$ and $\angle 3$ are opposite angles.
 $\angle 2$ and $\angle 4$ are opposite angles.

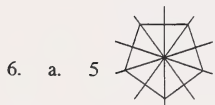
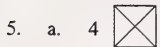
2. a. $90 - 38 = 52$
 $k = 52^\circ$
- b. $180 - 150 = 30$
 $n = 30^\circ$
- c. $180 - 71 = 109$
 $t = 109^\circ$
- d. $90 - 80 = 10$
 $p = 10^\circ$
- e. $45 + 58 = 103$
 $180 - 103 = 77$
 $b = 77^\circ$
- f. $90 - 38 = 52$
 $y = 52^\circ$
 $180 - 90 = 90$
 $x = 90^\circ$
- g. $m = 68^\circ$
 $180 - 68 = 112$
 $\ell = 112^\circ$
 $n = 112^\circ$
- h. $x = 70^\circ$
 $180 - 70 = 110$
 $y = 110^\circ$
 $z = 110^\circ$
 $180 - 50 = 130$
 $w = 130^\circ$
3. a. 180° b. 360° c. 540° d. 720° e. 900° f. 1080°
4. a. $90 + 30 = 120$
 $180 - 120 = 60$
 $x = 60^\circ$
- b. $180 - 90 = 90$
 $\frac{1}{2} \times 90 = 45$
 $m = 45^\circ$
- c. $120 + 40 = 160$
 $180 - 160 = 20$
 $d = 20^\circ$
- d. $50 + 60 = 110$
 $180 - 110 = 70$
 $t = 70^\circ$

Isoceles triangles have two congruent angles.

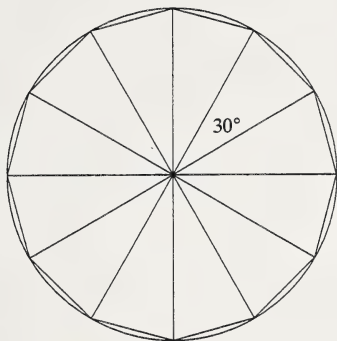
- e. $x = 70^\circ$
- f. $180 - 60 = 120$
 $o = 120^\circ$
- g. $n = 45^\circ$
 $180 - 45 = 135$
 $m = 135^\circ$
 $o = 135^\circ$

Opposite angles are congruent.

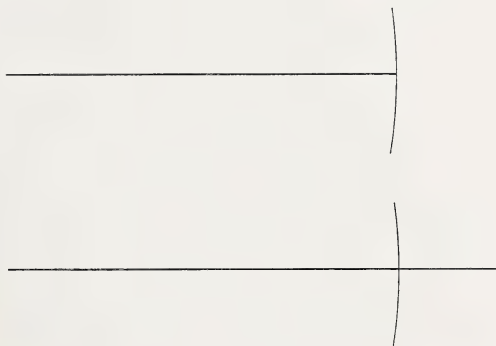
Adjacent angles are supplementary.



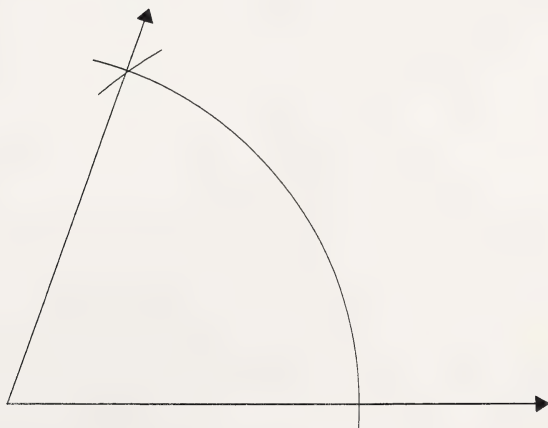
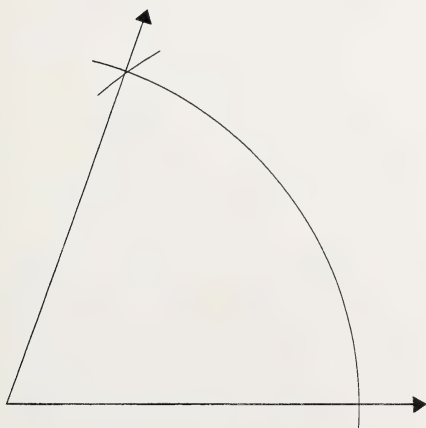
7. a. 5 (A regular pentagon will fit onto itself five times in one full turn.)
 b. 6 (A regular hexagon will fit onto itself six times in one full turn.)
 c. 7 (A regular heptagon will fit onto itself seven times in one full turn.)
8. $360 \div 12 = 30$



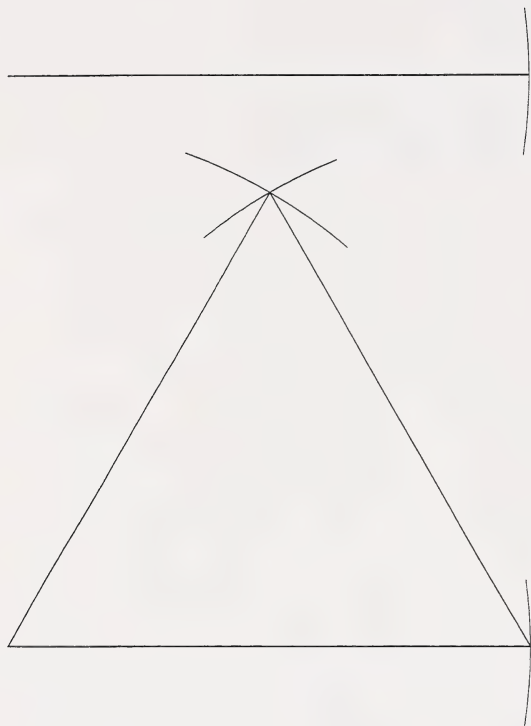
9. a.



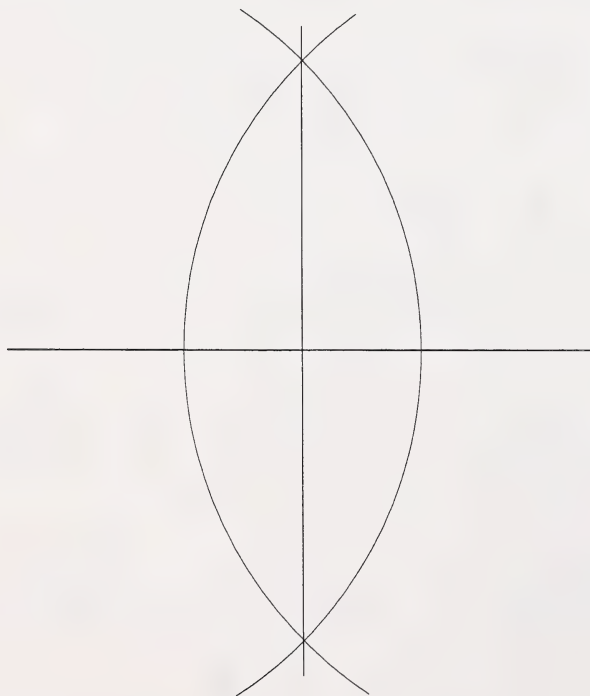
- b.



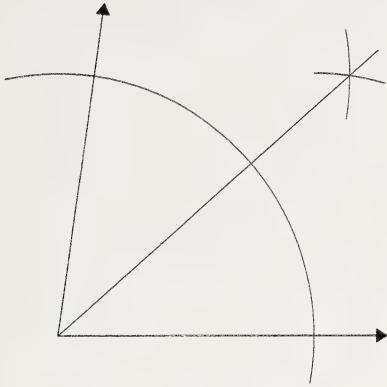
10.



11. a.

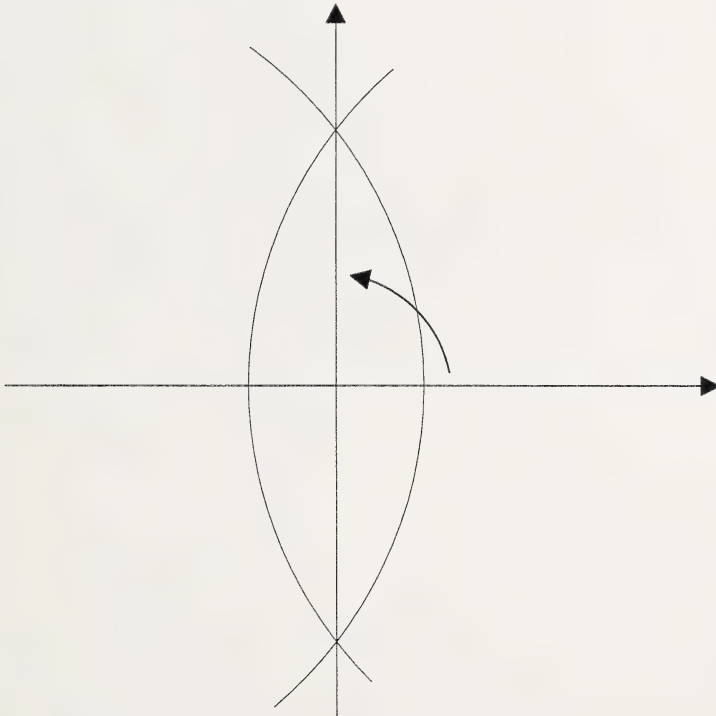


b.

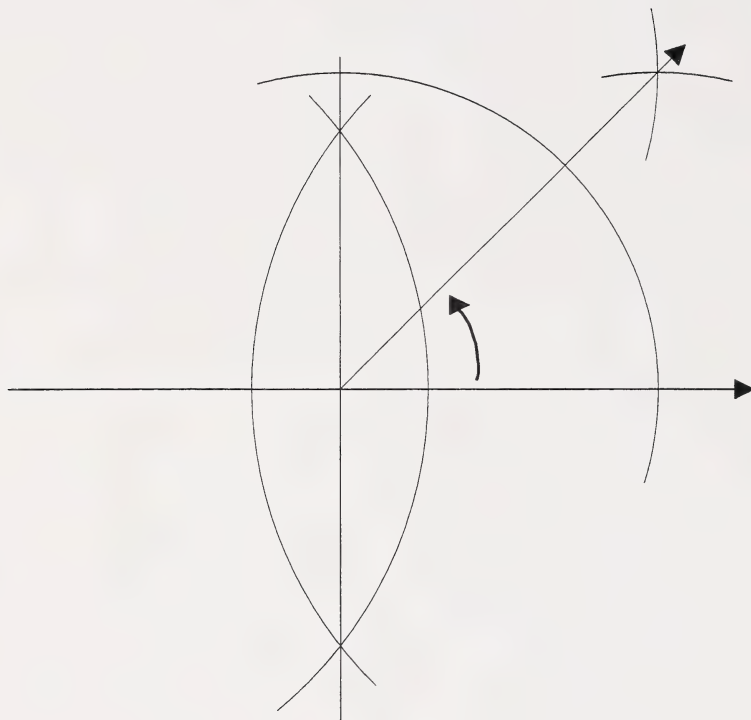


12. There are different methods to construct an angle of 90° . One method is shown.

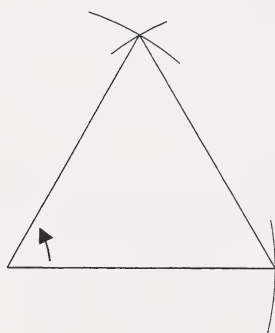
a.



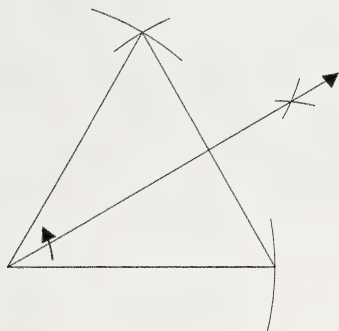
- b. Construct an angle of 90° and bisect it.



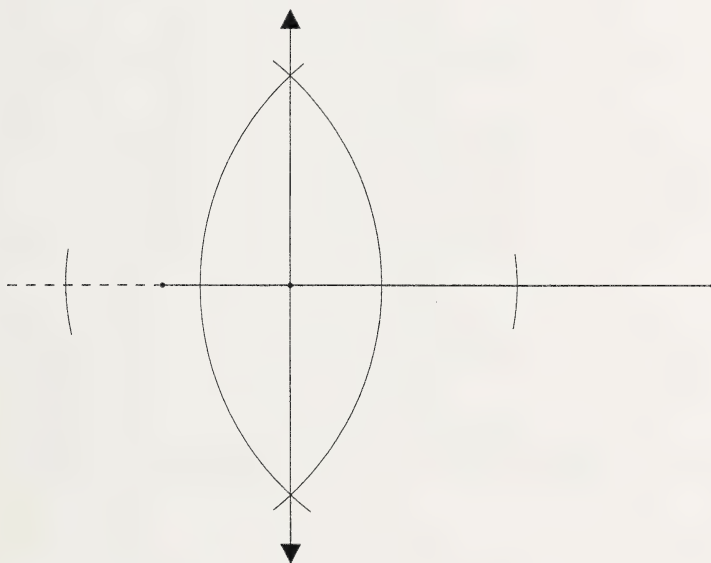
- c. Construct an equilateral triangle.



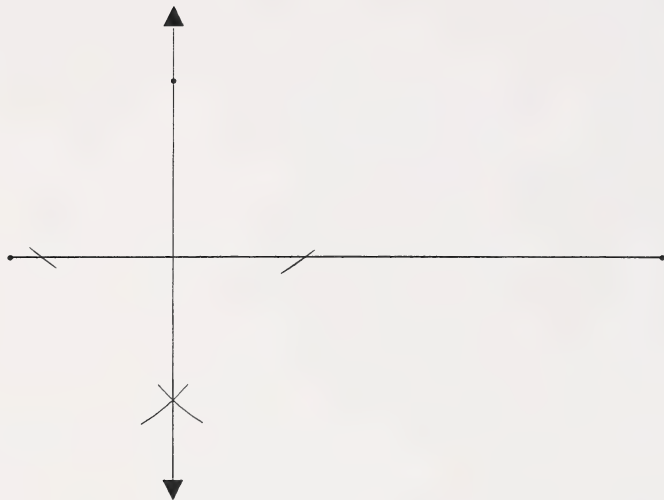
- d. Construct an equilateral triangle and bisect one angle.



13. a.



b.



$$\begin{aligned}
 14. \quad a. \quad P &= 2\ell + 2w \\
 &= 2 \times 9 + 2 \times 5 \\
 &= 18 + 10 \\
 &= 28
 \end{aligned}$$

The perimeter is 28 cm.

$$\begin{aligned}
 b. \quad P &= 3s \\
 &= 3 \times 6.2 \\
 &= 18.6
 \end{aligned}$$

The perimeter is 18.6 cm.

$$\begin{aligned}
 c. \quad P &= 2\ell + 2w \\
 &= 2 \times 10 + 2 \times 8 \\
 &= 20 + 16 \\
 &= 36
 \end{aligned}$$

The perimeter is 36 cm.

$$\begin{aligned}
 d. \quad P &= 6 + 6 + 5 + 8 \\
 &= 25
 \end{aligned}$$

The perimeter is 25 cm.

$$\begin{aligned}
 15. \quad a. \quad C &= \pi d \\
 &\doteq 3.14 \times 8 \\
 &\doteq 25.12
 \end{aligned}$$

The circumference is about 25.12 cm.

$$\begin{aligned}
 b. \quad C &= \pi d \\
 &\doteq 3.14 \times 10 \\
 &\doteq 31.4
 \end{aligned}$$

The circumference is about 31.4 cm.

$$\begin{aligned}
 16. \quad a. \quad P &= 8 + 5 + 12 + 5 + 20 + 10 \\
 &= 60
 \end{aligned}$$

The perimeter is 60 cm.

$$\begin{aligned}
 b. \quad P &= 6 + (2 \times 7) + (2 \times 5) + (2 \times 8) + 12 \\
 &= 6 + 14 + 10 + 16 + 12 \\
 &= 58
 \end{aligned}$$

The perimeter is 58 cm.

$$\begin{aligned} \text{c. } C &= \pi d \\ &\doteq 3.14 \times 6 \\ &\doteq 18.84 \end{aligned}$$

$$\begin{aligned} P &\doteq 9.42 + (2 \times 3) + (2 \times 8) + 12 \\ &\doteq 9.42 + 6 + 16 + 12 \\ &\doteq 43.42 \end{aligned}$$

So, the circumference of the semicircle is about 9.42 m.

The perimeter is about 43.42 m.

17. This problem can be solved in different ways. An algebraic solution is shown, but students may use the guess-check-revise method.

Let the width be w .

Let the length be $3w + 2$.

$$P = 2\ell + 2w$$

$$92 = 2(3w + 2) + 2w$$

$$92 = 6w + 4 + 2w$$

$$92 = 8w + 4$$

$$\begin{array}{r} -4 \\ \hline 88 = 8w \end{array}$$

$$88 = 8w$$

$$\frac{1}{8} \times \frac{88}{1} = \frac{11}{1} \times \frac{1}{8} \times \frac{8}{1} w$$

$$w = 11$$

If $w = 11$, then

$$3w + 2 = 3 \times 11 + 2$$

$$= 33 + 2$$

$$= 35$$

The length of the rectangle is 35 m.

The width of the rectangle is 11 m.

$$\begin{aligned} \text{18. a. } A &= b \times h \\ &= 12 \times 8 \\ &= 96 \end{aligned}$$

The area of the rectangle is 96 m^2 .

$$\begin{aligned} \text{b. } A &= b \times h \\ &= 8 \times 5 \\ &= 40 \end{aligned}$$

The area of the parallelogram is 40 cm^2 .

$$\begin{aligned} \text{c. } A &= \frac{b \times h}{2} \\ &= \frac{5 \times 14}{2} \\ &= \frac{70}{2} \\ &= 35 \end{aligned}$$

The area of the triangle is 35 cm^2 .

$$\begin{aligned} \text{d. } A &= \frac{(b_1 + b_2)h}{2} \\ &= \frac{(5 + 12) \times 2}{2} \\ &= \frac{17 \times 2}{2} \\ &= 17 \end{aligned}$$

The area of the trapezoid is 17 cm^2 .

$$\begin{aligned} \text{e. } A &= \frac{n \times s \times a}{2} \\ &= \frac{6 \times 5 \times 4.3}{2} \\ &= \frac{129}{2} \\ &= 64.5 \end{aligned}$$

The area of the regular hexagon is 64.5 cm^2 .

19. a. $A = \pi r^2$
 $\doteq 3.14 \times 3^2$
 $\doteq 3.14 \times 9$
 $\doteq 28.26$

The area of the circle is about 28.26 cm^2 .

20. a. $A = \pi r^2$
 $\doteq 3.14 \times 3^2$
 $\doteq 3.14 \times 9$
 $\doteq 28.26$

So, the area of the semicircle is about 14.13 m^2 .

$$A = b \times h$$

$$= 12 \times 8$$

$$= 96$$

The area of the rectangle is 96 m^2 .

$$14.13 + 96 = 110.13$$

The total area is 110.13 m^2 .

b. $A = b \times h$
 $= 6 \times 7$
 $= 42$

The area of one rectangle is 42 cm^2 .

$$A = b \times h$$

$$= 12 \times 8$$

$$= 96$$

The area of the second rectangle is 96 cm^2 .

$$A = \frac{(b_1 + b_2)h}{2}$$

$$= \frac{(6 + 12)4}{2}$$

$$= \frac{72}{2}$$

$$= 36$$

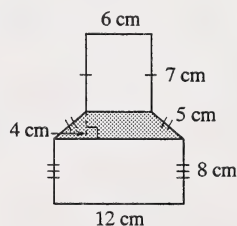
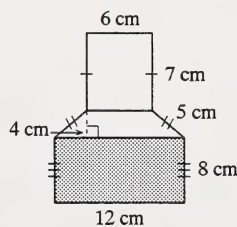
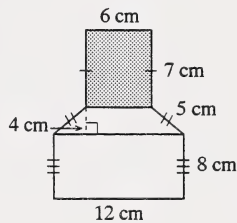
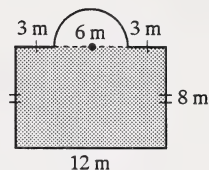
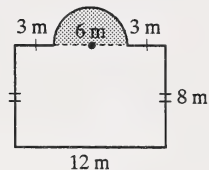
The area of the trapezoid is 36 cm^2 .

$$42 + 96 + 36 = 174$$

The total area is 174 cm^2 .

b. $A = \pi r^2$
 $\doteq 3.14 \times 7^2$
 $\doteq 3.14 \times 49$
 $\doteq 153.86$

The area of the circle is about 153.86 mm^2 .



21. a. $a^2 + b^2 = c^2$

$$8^2 + 6^2 = c^2$$

$$64 + 36 = c^2$$

$$100 = c^2$$

$$10 = c$$

The missing side is 10 m.

b. $a^2 + b^2 = c^2$

$$a^2 + 8^2 = 17^2$$

$$a^2 + 64 = 289$$

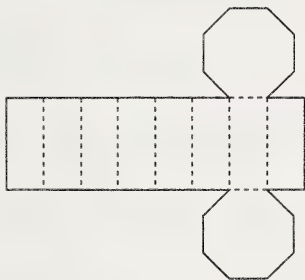
$$\begin{array}{r} \cancel{a^2 + 64} - 64 \\ \hline a^2 = 225 \end{array}$$

$$a = 15$$

The missing side is 15 cm.

22. a. rectangular prism b. triangular prism c. pentagonal prism d. hexagonal prism e. cylinder

23.



24. There are different ways to calculate the surface area. One method is shown.

a. $B = b \times h$

$$= 2.5 \times 1.8$$

$$= 4.5$$

The area of the base is 4.5 m^2 .

$$P = 2\ell + 2w$$

$$= (2 \times 2.5) + (2 \times 1.8)$$

$$= 5 + 3.6$$

$$= 8.6$$

The perimeter of the base is 8.6 m.

$$SA = 2B + P \times H$$

$$= (2 \times 4.5) + (8.6 \times 4.1)$$

$$= 9 + 35.26$$

$$= 44.26$$

The surface area of the rectangular prism is 44.26 m^2 .

b. $B = \pi r^2$

$$= 3.14 \times (5.5)^2$$

$$= 3.14 \times 30.25$$

$$= 95$$

The area of the base is about 95 cm^2 .

$$C = \pi d$$

$$= 3.14 \times 11$$

$$= 34.54$$

The circumference of the base is about 34.5 cm.

$$SA = 2B + C \times H$$

$$= (2 \times 95) + (34.54 \times 35)$$

$$= 190 + 1208.9$$

$$= 1398.9$$

The surface area of the cylinder is about 1398.9 cm^2 .

$$\begin{aligned} \text{c. } B &= \frac{b \times h}{2} \\ &= \frac{6.6 \times 8}{2} \\ &= 26.4 \end{aligned}$$

The area of the base is 26.4 cm^2 .

$$\begin{aligned} P &= 3 \times 6.6 \\ &= 19.8 \end{aligned}$$

The perimeter is 19.8 cm .

$$\begin{aligned} SA &= 2B + P \times H \\ &= (2 \times 26.4) + (19.8 \times 10.7) \\ &= 52.8 + 211.86 \\ &= 264.66 \end{aligned}$$

The surface area of the triangular prism is 264.66 cm^2 .

$$\begin{aligned} \text{d. } B &= \frac{n \times s \times a}{2} \\ &= \frac{5 \times 5.5 \times 6.8}{2} \\ &= 93.5 \end{aligned}$$

The area of the base is 93.5 m^2 .

$$\begin{aligned} P &= n \times s \\ &= 5 \times 5.5 \\ &= 27.5 \end{aligned}$$

The perimeter of the base is 27.5 m .

$$\begin{aligned} SA &= 2B + P \times H \\ &= (2 \times 93.5) + (27.5 \times 15) \\ &= 187 + 412.5 \\ &= 599.5 \end{aligned}$$

The surface area of the pentagonal prism is 599.5 m^2 .

$$\begin{aligned} 25. \quad B &= \pi r^2 \\ &\doteq 3.14 \times (3.5)^2 \\ &\doteq 3.14 \times 12.25 \\ &\doteq 38.465 \end{aligned}$$

The area of the base is about 38.465 cm^2 .

$$\begin{aligned} SA &= B + C \times H \\ &\doteq 38.465 + (21.98 \times 11.5) \\ &\doteq 38.465 + 252.77 \\ &\doteq 291.235 \end{aligned}$$

The surface area of the exterior of the glass is about 291.2 cm^2 .

$$\begin{aligned} C &= \pi d \\ &\doteq 3.14 \times 7 \\ &\doteq 21.98 \end{aligned}$$

The circumference of the base is about 21.98 cm .

$$\begin{aligned} 26. \quad \text{a. } B &= b \times h \\ &= 2.5 \times 1.8 \\ &= 4.5 \end{aligned}$$

The area of the base is 4.5 m .

$$\begin{aligned} V &= B \times H \\ &= 4.5 \times 4.1 \\ &= 18.45 \end{aligned}$$

The volume of the rectangular prism is 18.45 m^3 .

$$\begin{aligned} \text{b. } B &= \pi r^2 \\ &\doteq 3.14 \times (5.5)^2 \\ &\doteq 3.14 \times 30.25 \\ &\doteq 95 \end{aligned}$$

The area of the base is about 95 cm^2 .

$$\begin{aligned} V &= B \times H \\ &\doteq 95 \times 35 \\ &\doteq 3325 \end{aligned}$$

The volume of the cylinder is about 3325 cm^3 .

$$\begin{aligned} \text{c. } B &= \frac{b \times h}{2} \\ &= \frac{6.6 \times 8}{2} \\ &= 26.4 \end{aligned}$$

The area of the base is 26.4 cm.

$$\begin{aligned} V &= B \times H \\ &= 26.4 \times 10.7 \\ &= 282.48 \end{aligned}$$

The volume of the triangular prism is 282.48 cm³.

$$\begin{aligned} \text{d. } B &= \frac{n \times s \times a}{2} \\ &= \frac{5 \times 5.5 \times 6.8}{2} \\ &= 93.5 \end{aligned}$$

The area of the base is 93.5 m.

$$\begin{aligned} V &= B \times H \\ &= 93.5 \times 15 \\ &= 1402.5 \end{aligned}$$

The volume of the pentagonal prism is 1402.5 m³.

Note: It is recommended that students review the notes and do a few sample questions from the sections which correspond to the questions with which they experienced success.

It is recommended that students carefully study the notes and do most of the questions in the Practice Activities in the sections which correspond to the questions with which they experienced difficulties.

Questions	Skills	Sections
1, 2	interpreting supplementary, complimentary, adjacent, and opposite angles	2
3, 4	determining the sum of the angles in polygons	3
5, 6, 7	recognizing attributes of regular polygons	4
8	constructing a regular polygon using a protractor, straightedge, and compass	4
9	constructing congruent segments and angles	5
10	constructing an equilateral triangle	5
11	bisecting segments and angles	6
12	constructing specific angles	6
13	constructing perpendicular lines	7
14, 15, 16	computing perimeter and circumference	8
17	solving problems involving perimeter	8
18, 19, 20,	calculating area	9
21	using the Pythagorean theorem	10
22	naming prisms and cylinders	11
23	sketching nets of prisms and cylinders	11
24, 25	calculating surface area	12
26	calculating volume	13

Assignment Answer Key

Part 1: Short-answer Questions

$$\begin{array}{lll}
 1. \quad a. \quad 180 - 70 = 110 & 180 - 110 = 70 & 180 - (70 + 55) = 180 - 125 \\
 & f = 110^\circ & d = 70^\circ \\
 & & = 55 \\
 & & c = 55^\circ
 \end{array}$$

$$\begin{array}{ll}
 b. \quad 180 - (90 + 28) = 180 - 118 & 180 - 28 = 152 \\
 = 62 & b = 152^\circ \\
 a = 62^\circ &
 \end{array}$$

$$\begin{array}{llll}
 c. \quad 180 - 154 = 26 & 180 - (31 + 26) = 180 - 57 & 180 - 123 = 57 & 180 - (31 + 123) = 180 - 154 \\
 p = 26^\circ & = 123 & r = 57^\circ & = 26 \\
 & q = 123^\circ & t = 57^\circ & u = 26^\circ \\
 & s = 123^\circ & &
 \end{array}$$

2. Let the sum of the angles be s .
Let the number of sides be n .

$$\begin{array}{l}
 a. \quad s = (n - 2) \times 180 \\
 = (6 - 2) \times 180 \\
 = 4 \times 180 \\
 = 720
 \end{array}$$

or



The sum of the angles of this hexagon is 720° .

4 triangles can be formed. $4 \times 180 = 720$

$$\begin{array}{l}
 b. \quad s = (n - 2) \times 180 \\
 = (10 - 2) \times 180 \\
 = 8 \times 180 \\
 = 1440
 \end{array}$$

or



The sum of the angles of this decagon is 1440° .

8 triangles can be formed. $8 \times 180 = 1440$

$$\begin{array}{l}
 c. \quad s = (n - 2) \times 180 \\
 = (12 - 2) \times 180 \\
 = 10 \times 180 \\
 = 1800
 \end{array}$$

or



The sum of the angles of this dodecagon is 1800° .

10 triangles can be formed. $10 \times 180 = 1800$

3. a. $a^2 + b^2 = c^2$

$$4^2 + 9^2 = c^2$$

$$16 + 81 = c^2$$

$$97 = c^2$$

$$c = \sqrt{97}$$

$$\doteq 9.8$$

The missing side is about 9.8 cm.

b. $a^2 + b^2 = c^2$

$$4^2 + 4^2 = c^2$$

$$16 + 16 = c^2$$

$$32 = c^2$$

$$c = \sqrt{32}$$

$$\doteq 5.7$$

The missing side is about 5.7 cm.

c. $a^2 + b^2 = c^2$

$$a^2 + 7^2 = 14^2$$

$$a^2 + 49 = 196$$

$$\begin{array}{r} a^2 + 49 = 196 \\ -49 \quad -49 \\ \hline a^2 \end{array}$$

$$= 147$$

$$a = \sqrt{147}$$

$$\doteq 12.1$$

The missing side is about 12.1 cm.

4. a. This is a cylinder.

$$B = \pi r^2$$

$$\doteq 3.14 \times 4^2$$

$$\doteq 3.14 \times 16$$

$$\doteq 50.24$$

$$C = \pi d$$

$$\doteq 3.14 \times 8$$

$$\doteq 25.12$$

$$SA = 2B + CH$$

$$\doteq 2 \times 50.24 + 25.12 \times 15$$

$$\doteq 100.48 + 376.8$$

$$\doteq 477.28$$

$$V = BH$$

$$\doteq 50.24 \times 15$$

$$\doteq 753.6$$

The volume of the cylinder is about 753.6 m³.

The surface area of the cylinder

is about 477.28 m².

- b. This is an octagonal prism

$$B = \frac{n \times s \times a}{2}$$

$$= \frac{8 \times 7 \times 9}{2}$$

$$= 252$$

$$P = n \times s$$

$$= 8 \times 7$$

$$= 56$$

$$SA = 2B + PH$$

$$= 2 \times 252 + 56 \times 40$$

$$= 504 + 2240$$

$$= 2744$$

$$V = BH$$

$$= 252 \times 40$$

$$= 10\,080$$

The volume of the octagonal prism is

10 080 cm³.

The surface area of the octagonal

prism is 2744 cm².

- c. This is a triangular prism.

$$B = \frac{b \times h}{2}$$

$$= \frac{24 \times 9}{2}$$

$$= 108$$

$$P = 15 + 15 + 24$$

$$= 30 + 24$$

$$= 54$$

$$SA = 2B + PH$$

$$= 2 \times 108 + 54 \times 30$$

$$= 216 + 1620$$

$$= 1836$$

$$V = BH$$

$$= 108 \times 30$$

$$= 3240$$

The volume of the triangular prism is

3240 mm³.

The surface area of the triangular

prism is 1836 mm².

- d. This is a rectangular prism.

$$B = b \times h$$

$$= 8 \times 8$$

$$= 64$$

$$P = n \times s$$

$$= 4 \times 8$$

$$= 32$$

$$SA = 2B + PH$$

$$= 2 \times 64 + 32 \times 15$$

$$= 128 + 480$$

$$= 608$$

$$V = BH$$

$$= 64 \times 15$$

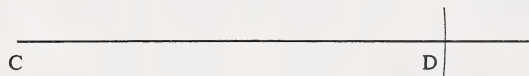
$$= 960$$

The volume is 960 mm³.

The surface area is 608 mm².

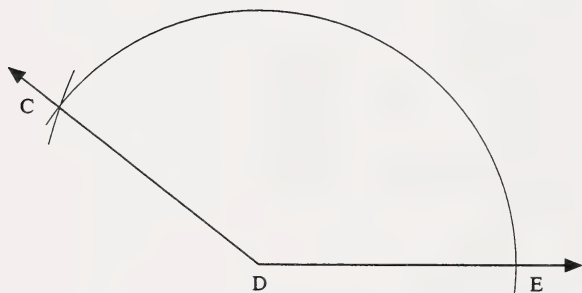
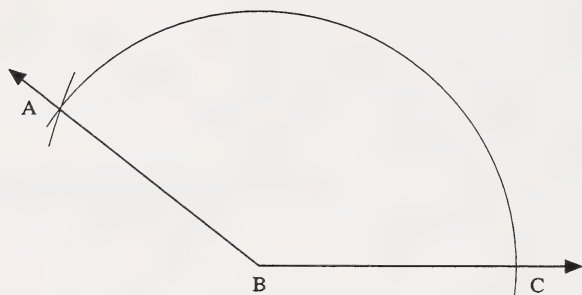
Part 2: Constructions

1.



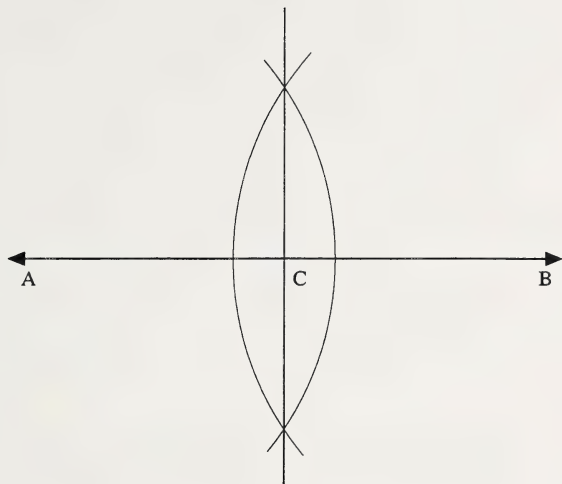
$$\overline{CD} \cong \overline{AB}$$

2.



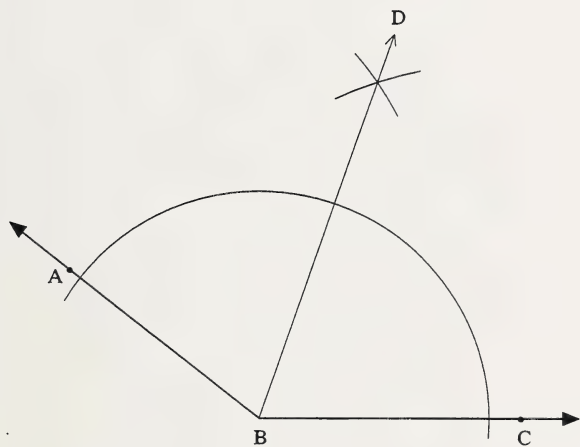
$$\angle CDE \cong \angle ABC$$

3.



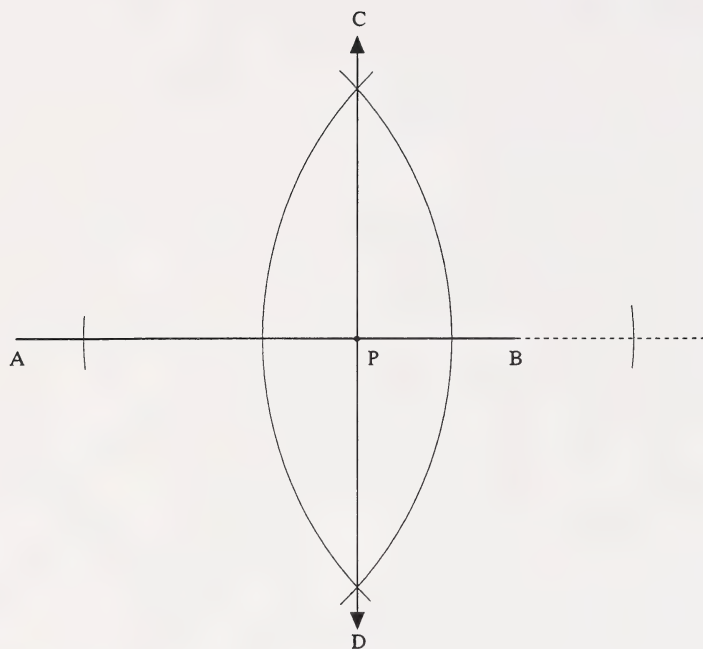
$$\overline{AC} \cong \overline{CB}$$

4.



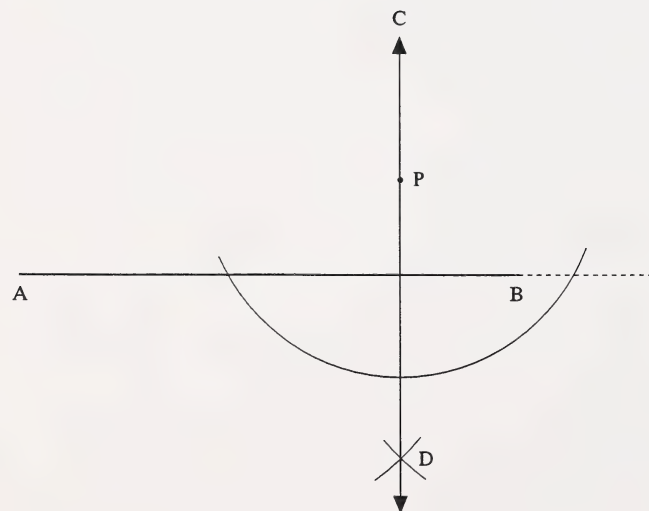
$$\angle ABD \cong \angle DBC$$

5.

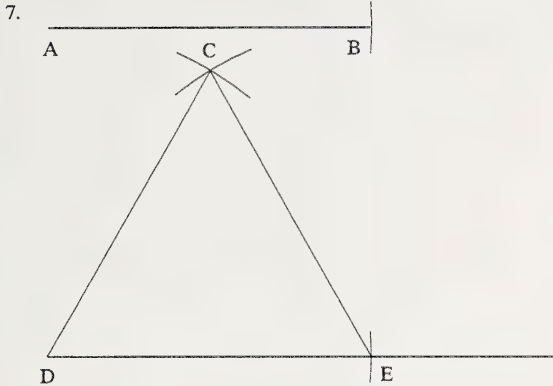


$\overleftrightarrow{CD} \perp \overline{AB}$ and passes through P.

6.



$\overleftrightarrow{CD} \perp \overline{AB}$ and passes through P.

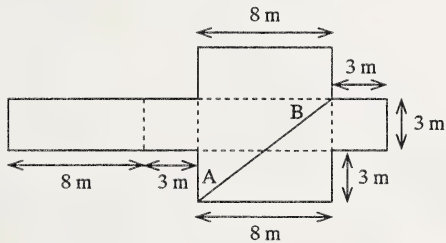


$\triangle CDE$ is an equilateral triangle with sides congruent to $\overline{AB}$.

8. Construct a pair of perpendicular lines and then bisect one of the right angles formed.

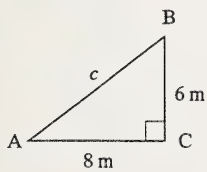
Part 3: Problems

1. a.



The shortest path is $\overline{AB}$.

- b.



$$a^2 + b^2 = c^2$$

$$6^2 + 8^2 = c^2$$

$$36 + 64 = c^2$$

$$100 = c^2$$

$$c = 10$$

The shortest distance the spider would travel to get to the fly is 10 m.

2. $B = \pi r^2$

$$\approx 3.14 \times (2.5)^2$$

$$\approx 3.14 \times 6.25$$

$$\approx 19.625$$

$$C = \pi d$$

$$\approx 3.14 \times 5$$

$$\approx 15.7$$

$$SA = B + CH$$

$$\approx 19.625 + 15.7 \times 5.8$$

$$\approx 19.625 + 91.06$$

$$\approx 110.685$$

$$\approx 110.7$$

The surface area is 110.7 m^2 .

The bottom is not painted.

$$110.7 \div 12 = 9.225$$

To paint the tank, 10 L of paint is required.

$$10 \times 15.20 = 152$$

To paint the tank, it will cost \$152.

3.	$B = \pi r^2$	$B = \pi r^2$	$V = BH$	$V = BH$
	$\doteq 3.14 \times 5^2$	$\doteq 3.14 \times 3^2$	$\doteq 78.5 \times 2.5$	$\doteq 28.26 \times 2.5$
	$\doteq 3.14 \times 25$	$\doteq 3.14 \times 9$	$\doteq 196.25$	$\doteq 70.65$
	$\doteq 78.5$	$\doteq 28.26$		

$$196.25 - 70.65 = 125.6$$

The volume of the washer is 125.6 mm³.

4. Methods may vary. An algebraic solution is shown.

Let x be the measure of the smaller angle.

Let $2x + 3$ be the measure of the larger angle.

$$x + 2x + 3 = 90$$

$$3x + 3 = 90$$

$$\begin{array}{r} 3x + 3 = 90 \\ -3 \quad -3 \\ \hline 3x = 87 \\ x = 29 \end{array}$$

The smaller angle is 29°.

If $x = 29$, then

$$2x + 3 = 2 \times 29 + 3$$

$$= 58 + 3$$

$$= 61$$

The larger angle is 61°.

5. Let the length of each leg be a .

$$a^2 + a^2 = (2.2)^2$$

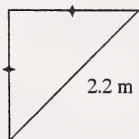
$$2a^2 = 4.84$$

$$\frac{1}{2} \times 2a^2 = \frac{1}{2} \times 4.84$$

$$a^2 = 2.42$$

$$a = \sqrt{2.42}$$

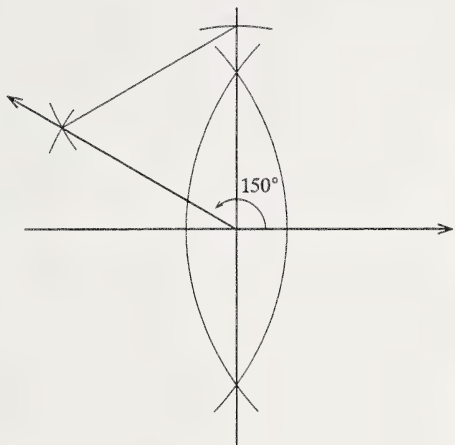
$$\doteq 1.6$$



Each leg is about 1.6 m. So, the length of the side of the largest table that can be cut is about 1.6 m.

6. Constructions will vary, but should include constructing an equilateral triangle with angles of 60° and constructing an angle of 90° by bisecting an angle of 180° or constructing a perpendicular. An example is shown.

$$60 + 90 = 150$$



7.

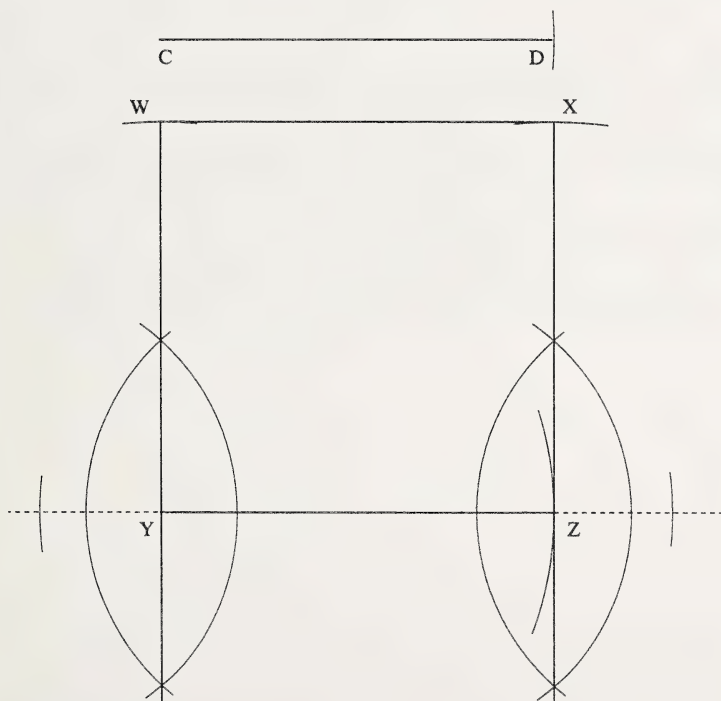


Figure WXYZ is a square with sides congruent to $\overline{CD}$.

Module 7: Data Management

Gathering Materials

In this module the student will need the following items available from the Learning Resources Distributing Centre.

- Student Module 7: Data Management
- Assignment Booklet for Module 7
- optional course audiocassette for Module 7

Students may wish to view one of the following video programs.

- *MATH WORKS: Sampling*
- *SOLVE IT: Sampling*

Students may use the following computer programs if they have access to them and an Apple™ or compatible computer.

- Program 1 “Three Ms” on Disk A of *Mathematics Activities Courseware 8* (Houghton Mifflin)
- Program 15 “Probable Urnings” on Disk C of *Mathematics Activities Courseware 8* (Houghton Mifflin)

In addition, the students will need a binder and loose-leaf paper for their responses, a scientific calculator with a $\boxed{a\frac{b}{c}}$ key, and a geometry set.

Hold the Assignment Booklet for safekeeping until the student is ready for it.

Guiding the Student

Each section of Module 7 deals with a different aspect of data management. Sections 2 and 4 review previously developed skills. The Pretest in Section 1 will help you discover the student’s strengths and weaknesses and make a personal study plan.

Ensure that the student reads the welcome pages and the module introduction, and does Section 1. Then check the answers to the Pretest (suggested answers follow). Help the student develop a personal study plan and schedule. An average student spends about three weeks of a 40-week school year on Module 7.

Use the guidelines provided at the beginning of this guide to monitor the student’s progress and provide encouragement.

Refer to the suggested answers in the Appendix of Student Module 7: Data Management when guiding the student through the Practice Activities in Module 7.

Section 1: Pretest

1. a.

Survey of Grade 9C Students		
Number of Fillings	Tally	Frequency
0		5
1		3
2		2
3		3
4		4
5		1
6		3
7		2
8		2

$$\begin{aligned}
 \text{b. } \frac{(5 \times 0) + (3 \times 1) + (2 \times 2) + (3 \times 3) + (4 \times 4) + (1 \times 5) + (3 \times 6) + (2 \times 7) + (2 \times 8)}{25} &= \frac{0 + 3 + 4 + 9 + 16 + 5 + 18 + 14 + 16}{25} \\
 &= \frac{85}{25} \\
 &= 3.4
 \end{aligned}$$

The mean is 3.4 fillings.

c.

Survey of Grade 9C Students		
Number of Fillings	Tally	Frequency
0		5
1		3
2		2
3		3
4		4
5		1
6		3
7		2
8		2

Median →

← 1

12

12

The median is 3 fillings.

d.

Survey of Grade 9C Students		
Number of Fillings	Tally	Frequency
0		5
1		3
2		2
3		3
4		4
5		1
6		3
7		2
8		2

Mode →

← Most frequent

The mode is 0 fillings.

e. $8 - 0 = 8$

The range is 0 to 8 fillings.

- f. 7 out of 25 students have more fillings than Jason.

$$\frac{7}{25} = \frac{28}{100}$$

Jason is in the 28th percentile.

2. a. Chinese b. 400 000 000 c. 100 000 000

3. a. 25 b. 1999 c. \$2 000 000

4. a. 8 a.m.
b. 12 noon – 1 p.m.
c. 5 p.m.
d. The driver is probably a taxi driver or salesperson. The driver is driving most of the day.
e. 1 p.m.
f. 35 L
g. 50 L
h. 10 L

5. a. Ontario and British Columbia

b. $18\% \text{ of } 14\,009\,000 = 0.18 \times 14\,009\,000$
 $= 2\,521\,620$

c. $18\% \text{ of } 25\,354\,000 = 0.18 \times 25\,354\,000$
 $= 4\,563\,720$

In 1951 the population of the prairies was 2 521 620.

In 1986 the population of the prairies was 4 563 720.

6. a. The number of sales of rock compact discs is about nine times the sales of jazz compact discs. However, the picture representing the number of sales of rock compact discs is nine times as high and also nine times as wide as the picture representing the number of sales of jazz compact discs. The pictures are out of proportion. It would be fairer to represent every 100 sales with one picture of a compact disc than to use the different-sized pictures.
- b. The profits in June are only \$400 more than the profits in January. The profits increased by 5%. However, the title and the slope of the line gives the appearance that profits have soared. The scale on the vertical axis is broken. It would be fairer to use an unbroken scale.
7. a. population: an entire set or group from which data is collected.
b. census: a count or measure of a property of a population
c. sample: a part of a population
d. biased sample: a sample that is not representative of a whole population.
e. random sample: the selection of a sample so that each member of the population has an equal chance of being chosen
8. a. Greta could visit every household in the town and question each family.
- b. Greta could get a list of the addresses of all the households from the town office. Then she could select 10% in a random way. She could then visit these sample households and question each family.
9. The second technique is better. The first technique would not give a representative sample of the population. The children getting off the school bus probably live farther away.

10. The second technique would produce more accurate results because about 10% of the population would be polled. The first technique uses too small a sample. The people polled may not be representative of the entire population.

$$\begin{array}{lll}
 11. & P(\text{Alberta}) = \frac{1\,296\,000}{11\,477\,000} & P(\text{Alberta}) = \frac{1\,296\,000}{11\,477\,000} & P(\text{Alberta}) = \frac{1\,296\,000}{11\,477\,000} \\
 & = \frac{1296}{11\,477} & \approx 0.11 & \approx 11\%
 \end{array}$$

The probability is $\frac{1296}{11\,477}$, about 0.11, or about 11%.

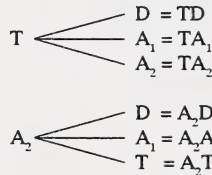
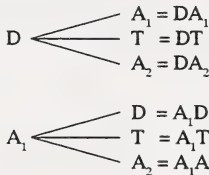
$$\begin{array}{lll}
 12. \text{ a. } & P(2) = \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} & P(2) = \frac{1}{5} & P(2) = \frac{1}{5} \\
 & = \frac{1}{5} & = 0.2 & = \frac{20}{100} \\
 & & & = 20\%
 \end{array}$$

The probability is $\frac{1}{5}$, 0.2, or 20%.

$$\begin{array}{lll}
 \text{b. } & P(\text{even number}) = \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} & P(\text{even number}) = \frac{2}{5} & P(\text{even number}) = \frac{2}{5} \\
 & = \frac{2}{5} & = 0.4 & = \frac{40}{100} \\
 & & & = 40\%
 \end{array}$$

The probability is $\frac{2}{5}$, 0.4, or 40%.

13. Possible outcomes



- a. Favourable outcome: A_1A_2, A_2A_1

$$\begin{array}{lll}
 P(\text{two As}) = \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} & P(\text{two As}) = \frac{2}{12} & P(\text{two As}) = \frac{2}{12} \\
 = \frac{2}{12} & = \frac{1}{6} & = \frac{1}{6} \\
 = \frac{1}{6} & = 0.1\bar{6} & = 16\frac{2}{3}\%
 \end{array}$$

The probability of picking two As is $\frac{1}{6}$, $0.1\bar{6}$, or $16\frac{2}{3}\%$.

b. Favourable outcomes: DT, TD

$$\begin{aligned} P(\text{two consonants}) &= \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} \\ &= \frac{2}{12} \\ &= \frac{1}{6} \end{aligned}$$

$$\begin{aligned} P(\text{two consonants}) &= \frac{2}{12} \\ &= \frac{1}{6} \\ &= 0.1\dot{6} \end{aligned}$$

$$\begin{aligned} P(\text{two consonants}) &= \frac{2}{12} \\ &= \frac{1}{6} \\ &= 16\frac{2}{3}\% \end{aligned}$$

The probability of picking two consonants is $\frac{1}{6}$, $0.1\dot{6}$, or $16\frac{2}{3}\%$.

c. Favourable outcomes: DA₁, DA₂, TA₁, TA₂, A₁D, A₁T, A₂D, A₂T

$$\begin{aligned} P(\text{a vowel and a consonant}) &= \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} \\ &= \frac{8}{12} \\ &= \frac{2}{3} \end{aligned}$$

$$\begin{aligned} P(\text{a vowel and a consonant}) &= \frac{2}{3} \\ &= 0.\dot{6} \end{aligned}$$

$$\begin{aligned} P(\text{a vowel and a consonant}) &= \frac{2}{3} \\ &= 66\frac{2}{3}\% \end{aligned}$$

The probability of picking a vowel and a consonant is $\frac{2}{3}$, $0.\dot{6}$, or $66\frac{2}{3}\%$.

Note: It is recommended that the students review and do a few sample questions from the Practice Activities in the sections which correspond to the questions with which they experienced success.

It is recommended that students carefully study the notes and do most of the questions in the Practice Activities in the sections which correspond to the questions with which they experienced difficulties.

Questions	Skills	Sections
1.a.	making a frequency chart	2
1.b.	finding the mean	3
1.c.	finding the median	3
1.d.	finding the mode	3
1.e.	finding the range	3
1.f.	finding the percentile	3
2	interpreting bar graphs	2
3	interpreting pictographs	2
4	interpreting line graphs	2

Questions	Skills	Sections
5	interpreting circle graphs	2
6	recognizing misleading graphs	2
7	interpreting populations, censuses, samples, biased samples, and random samples	4
8.a.	conducting a census	4
8.b.	conducting a sample	4
9, 10	recognizing a biased sample	4
11, 12, 13	finding probability	5

Assignment Answer Key

Part 1: Probability

1. a. never, impossible
- b. positively, always

$$\begin{array}{ll}
 2. \quad a. \quad P(\text{Carla}) = \frac{5}{200} & P(\text{Carla}) = \frac{1}{40} \\
 & = 0.025 \text{ or } 2.5\% \\
 & = \frac{1}{40}
 \end{array}$$

The probability that Carla will win is $\frac{1}{40}$, 0.025, or 2.5% if all the tickets are sold.

$$\begin{array}{ll}
 b. \quad P(\text{Carla}) = \frac{5}{145} & P(\text{Carla}) = \frac{1}{29} \\
 & = 0.034 \text{ or } 3.4\% \\
 & = \frac{1}{29}
 \end{array}$$

The probability that Carla will win is $\frac{1}{29}$, about 0.34, or about 3.4% if 145 tickets are sold.

$$\begin{array}{ll}
 3. \quad a. \quad P(16^\circ \text{ to } 18^\circ) = \frac{14}{155} & P(16^\circ \text{ to } 18^\circ) = \frac{14}{155} \\
 & = 0.09 \text{ or } 9\%
 \end{array}$$

The probability that the daily temperature will be 16° to 18°C is $\frac{14}{155}$, about 0.09, or about 9%.

$$\begin{array}{ll}
 b. \quad P(28^\circ \text{ to } 30^\circ) = \frac{30}{155} & P(28^\circ \text{ to } 30^\circ) = \frac{6}{31} \\
 & = 0.194 \text{ or } 19.4\% \\
 & = \frac{6}{31}
 \end{array}$$

The probability that the maximum daily temperature will be 28° to 30°C is $\frac{6}{31}$, about 0.194, or about 19.4%.

4. No, this is not reasonable. The outcomes are not equally likely to occur. Experiments show that few people have an accident crossing the street, so the probability cannot be 50%.

$$5. \quad a. \quad P(3) = \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} \quad P(3) = \frac{1}{3}$$

$$= \frac{1}{3} \quad = 0.\dot{3} \text{ or } 33\frac{1}{3}\%$$

The probability of picking 3 is $\frac{1}{3}$, $0.\dot{3}$, or $33\frac{1}{3}\%$.

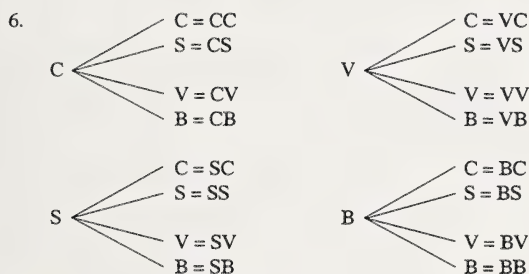
b. $P(\text{an odd number}) = 100\%$

c. $P(\text{an even number}) = 0\%$

$$d. \quad P(\text{a number less than 6}) = \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}} \quad P(\text{a number less than 6}) = \frac{2}{3}$$

$$= \frac{2}{3} \quad = 0.\dot{6} \text{ or } 66\frac{2}{3}\%$$

The probability of picking a number less than 6 is $\frac{2}{3}$, $0.\dot{6}$, or $66\frac{2}{3}\%$.



- a. Favourable outcomes: CS, CV, CB, SC, SV, SB, VC, VS, VB, BC, BS, BV

$$P(\text{two different flavours}) = \frac{12}{16} \quad P(\text{two different flavours}) = \frac{3}{4}$$

$$= \frac{3}{4} \quad = 0.75 \text{ or } 75\%$$

The probability of choosing two different flavours is $\frac{3}{4}$, 0.75 , or 75% .

- b. Favourable outcomes: CC, CS, CV, CB, SC, VC, BC

$$P(\text{at least one scoop of chocolate}) = \frac{7}{16} \quad P(\text{at least one scoop of chocolate}) = \frac{7}{16}$$

$$= 0.4375 \text{ or } 43.75\%$$

The probability that at least one scoop of chocolate is $\frac{7}{16}$, 0.4375 , or 43.75% .

- c. Favourable outcomes: CC, CB, BC, BB

$$P(\text{neither scoop is vanilla or strawberry}) = \frac{4}{16} \\ = \frac{1}{4}$$

$$P(\text{neither scoop is vanilla or strawberry}) = \frac{1}{4} \\ = 0.25 \text{ or } 25\%$$

The probability that neither scoop is vanilla or strawberry is $\frac{1}{4}$, 0.25, or 25%.

- d. Favourable outcomes: BS

$$P(BS) = \frac{1}{16} \quad P(BS) = \frac{1}{16} \\ = 0.0625 \text{ or } 6.25\%$$

The probability that the first scoop is banana and the second scoop is strawberry is $\frac{1}{16}$, 0.0625, or 6.25%.

7. Answers will vary.

Students should select samples randomly. The sample size should be adequate.

Ensure that the student describes the survey, reports the results of the survey, and calculates the probability.

Part 2: Analysing Data

$$1. \quad a. \quad \frac{80\,000 + 50\,000 + (3 \times 30\,000) + (5 \times 16\,500)}{10} = \frac{80\,000 + 50\,000 + 90\,000 + 82\,500}{10} \\ = \frac{302\,500}{10} \\ = 30\,250$$

The mean is \$30 250.

- b. 80 000, 50 000, 30 000, 30 000, 30 000, 16 500, 16 500, 16 500, 16 500, 16 500

$$\frac{30\,000 + 16\,500}{2} = \frac{46\,500}{2} \\ = 23\,250$$

The median is \$23 250.

- c. The mode is \$16 500.

- d. $80\,000 - 16\,500 = 63\,500$

The range is \$63 500.

- e. A

- f. C

- g. B

- h. The supervisor's salary is greater than eight other employees.

$$\begin{aligned}\frac{8}{10} &= \frac{80}{100} \\ &= 80\%\end{aligned}$$

The supervisor's salary is in the 80th percentile.

$$\begin{aligned}2. \quad a. \quad & \left[(4 \times 100) + (3 \times 95) + 90 + (4 \times 85) + 80 + (2 \times 75) + (2 \times 70) + (2 \times 65) + (2 \times 60) + (2 \times 55) + 50 + 45 \right] \div 25 \\ &= (400 + 285 + 90 + 340 + 80 + 150 + 140 + 130 + 120 + 110 + 50 + 45) \div 25 \\ &= 77.6\end{aligned}$$

The mean for 9A is 77.6.

The 13th score is 80. The median for 9A is 80.

The most frequent scores are 100 and 85. The modes for 9A are 100 and 85.

The highest score is 100. The lowest score is 45.

The range for 9A is 55.

$$\begin{aligned}b. \quad & \left[95 + (2 \times 90) + 85 + 80 + 70 + (2 \times 65) + (3 \times 60) + (6 \times 55) + (2 \times 50) + (2 \times 45) + 40 + 35 + 30 + 25 \right] \div 25 \\ &= (95 + 180 + 85 + 80 + 70 + 130 + 180 + 330 + 100 + 90 + 40 + 35 + 30 + 25) \div 25 \\ &= 58.8\end{aligned}$$

The mean for 9B is 58.8.

The 13th score is 55. The median for 9B is 55.

The most frequent score is 55. The mode for 9B is 55.

The highest score is 95. The lowest score is 25.

The range for 9B is 70.

- c. Sasha scored better than 12 students in 9A.

$$\begin{aligned}\frac{12}{25} &= \frac{48}{100} \\ &= 48\%\end{aligned}$$

Sasha's score is in the 48th percentile.

- d. Zoe scores better than 20 students in 9B.

$$\frac{20}{25} = \frac{80}{100}$$

Zoe's score is in the 80th percentile.

Final Test

Included here is the answer key to the final test and the student's copy of the final test which is designed for photocopying and possible faxing.

Note:

The answer key and student's copy of this final test should be kept secure by the teacher. Students should not have access to this test until it is assigned in a supervised situation. The answers should be stored securely and retained by the teacher at all times.

MATHEMATICS 9

FINAL TEST ANSWER KEY

$$\begin{aligned}
 1. \quad a. \quad -\frac{1}{2} + \frac{1}{3} \div \frac{1}{6} + \frac{5}{6} &= -\frac{1}{2} + \frac{1}{\cancel{3}} \times \frac{6}{1} + \frac{5}{6} \\
 &= -\frac{1}{2} + 2 + \frac{5}{6} \\
 &= -\frac{1}{2} + 2\frac{5}{6} \\
 &= -\frac{3}{6} + 2\frac{5}{6} \\
 &= 2\frac{2}{6} \\
 &= 2\frac{1}{3}
 \end{aligned}$$

$$\begin{aligned}
 b. \quad 1 - \left[\left(\frac{3}{8} - \frac{1}{2} \right) \div \frac{1}{4} \right] &= 1 - \left[\left(\frac{3}{8} - \frac{4}{8} \right) \div \frac{1}{4} \right] \\
 &= 1 - \left(-\frac{1}{8} \div \frac{1}{4} \right) \\
 &= 1 - \left(-\frac{1}{8} \times \frac{4}{1} \right) \\
 &= -1 - \left[-\left(\frac{1}{8} \times \frac{4}{1} \right) \right] \\
 &= 1 - \left(-\frac{1}{2} \right) \\
 &= 1 + \frac{1}{2} \\
 &= 1\frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 c. \quad 3 + 3^2 + 3^3 &= 3 + 9 + 27 \\
 &= 39
 \end{aligned}$$

$$\begin{aligned}
 d. \quad 2^4 \times 2^3 \div 2^2 &= 2^{4+3} \div 2^2 \\
 &= 2^7 \div 2^2 \\
 &= 2^{7-2} \\
 &= 2^5 \\
 &= 32
 \end{aligned}$$

$$\begin{aligned}
 e. \quad \left[(2-3)^3 \right]^2 &= \left[(-1)^3 \right]^2 \\
 &= (-1)^{2 \times 3} \\
 &= (-1)^6 \\
 &= 1
 \end{aligned}$$

2. a. a positive number

b. a positive number

3. There are not exactly 1 000 000 000 000 000 000 insects in the world. The first digit is the only one with any degree of accuracy. The zeros are merely placeholders to show the position of the decimal point. So, it is not reasonable to subtract 1 from 1 000 000 000 000 000 000.

4. The diameter of the virus is 9.95×10^{-6} mm.

5. Let the length of Path 2 be x

$$x^2 = 80^2 + 60^2$$

$$80 + 60 = 140$$

$$140 - 100 = 40$$

$$x^2 = 6400 + 3600$$

Path 1 is 140 m long.

Path 1 is 40 m longer than Path 2.

$$x^2 = 10\,000$$

$$x = 100$$

Path 2 is 100 m long.

6. This problem can be solved several ways. One method is shown.

Guess 1: Each coin has a mass of 9 g.

$$\text{Mass of coins: } 40 \times 9 = 360$$

$$30 \times 9 = 270$$

$$\text{Mass of jar: } 380 - 360 = 20$$

$$310 - 270 = 40$$

This guess is incorrect because $20 \neq 40$.

Guess 2: Each coin has a mass of 8 g.

$$\text{Mass of coins: } 40 \times 8 = 320$$

$$30 \times 8 = 240$$

$$\text{Mass of jar: } 380 - 320 = 60$$

$$310 - 240 = 70$$

This guess is incorrect because $60 \neq 70$.

Guess 3: Each coin has a mass of 7 g.

$$\text{Mass of coins: } 40 \times 7 = 280$$

$$30 \times 7 = 210$$

$$\text{Mass of jar: } 380 - 280 = 100$$

$$310 - 210 = 100$$

This guess is correct because $100 = 100$.

So, the coins each have a mass of 7 g.

7. a. $2(x+3) = 7$

$$2x + 6 = 7$$

$$\begin{array}{r} 2x + 6 = 7 \\ -6 \quad -6 \\ \hline 2x = 1 \end{array}$$

$$\frac{1}{2} \times 2x = \frac{1}{2} \times 1$$

$$x = \frac{1}{2}$$

b. $3b - 4 = b$

$$\begin{array}{r} 3b - 4 = b \\ -4 \quad -4 \\ \hline 3b = b - 4 \\ -b \quad -b \\ \hline 2b = -4 \end{array}$$

$$\frac{1}{2} \times 2b = \frac{1}{2} \times (-4)$$

$$\frac{1}{2} \times 2b = -\left(\frac{1}{2} \times 4\right)$$

$$b = -2$$

c. $5a - 3 = 2a + 3$

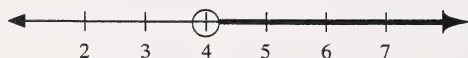
$$\begin{array}{r} 5a - 3 = 2a + 3 \\ -3 \quad +3 \\ \hline 5a = 2a + 6 \\ -2a \quad -2a \\ \hline 3a = 6 \end{array}$$

$$\frac{1}{3} \times 3a = \frac{1}{3} \times 6$$

$$a = 2$$

8. a. $x - 3 > 7$

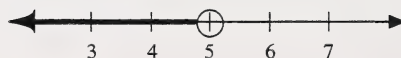
$$\begin{array}{r} x - 3 > 7 \\ +3 \quad +3 \\ \hline x > 10 \end{array}$$



b. $2y < 10$

$$\frac{1}{2} \times 2y < \frac{1}{2} \times 10$$

$$y < 5$$



9. a. $v = \sqrt{19.6h}$
 $= \sqrt{19.6 \times 5}$
 $= \sqrt{98}$
 ≈ 9.9

The speed of the discharge is about 9.9 m/s.

b. Two methods are possible. One is shown.

$$v = \sqrt{19.6h}$$

$$v^2 = 19.6h$$

$$\frac{v^2}{19.6} = \frac{19.6h}{19.6}$$

$$\frac{v^2}{19.6} = h$$

$$h = \frac{v^2}{19.6}$$

$$= \frac{5^2}{19.6}$$

$$= \frac{25}{19.6}$$

$$\approx 1.3$$

The height of the liquid above the hole is about 1.3 m.

10.

x	y	Pattern
1	4	$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} + 3$
2	7	
3	10	
4	13	

The relation can be described by the equation $y = 3x + 1$.

11. This problem may be solved several ways. One method is shown.

Let the rise in temperature be n .

$$\frac{6.5}{1000} \swarrow \searrow \frac{n}{5000}$$

$$6.5 \times 5000 = 1000n$$

$$32\,500 = 1000n$$

$$32.5 = n$$

The temperature rises 32.5°C .

$$-21.8 + 32.5 = 10.7$$

The temperature at the airport is 10.7°C .

12. This problem may be solved several ways. One method is shown.

$$30\% + 40\% + 20\% = 90\%$$

$$100\% - 90\% = 10\%$$

Let the number of chocolates be n .

$$10\% \text{ of } n = 5$$

$$0.1n = 5$$

$$n = 50$$

There are 50 chocolates in the box.

13. Each side of the outer palisade in the scale drawing is 4 cm.

$$\frac{1}{10} = \frac{4}{n}$$

$$n = 40$$

$$P = 4s$$

$$= 4 \times 40$$

$$= 160$$

Each side of the original outer palisade was 40 m.

The perimeter of the outer palisade was 160 m.

14. This problem may be done several ways. One method is shown.

Let the time the second cyclist is travelling be n . Let the time the first cyclist is travelling be $n + 2$.

	Distance	Speed	Time
Cyclist #1	$12(n + 2)$	12	$n + 2$
Cyclist #2	$18n$	18	n

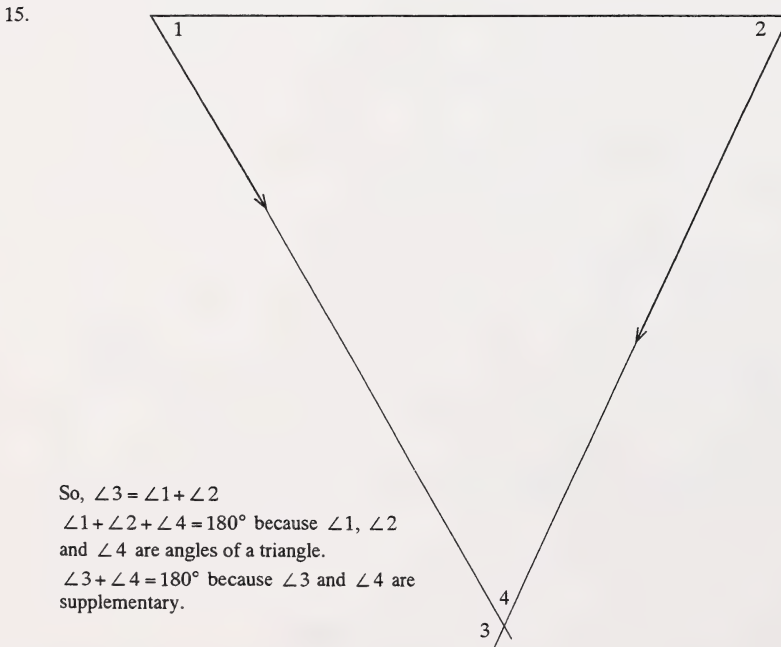
The cyclists travel the same distance. Write an equation to show this.

$$18n = 12(n + 2)$$

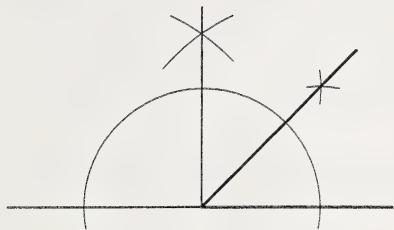
$$18n = 12n + 24$$

$$\begin{array}{r} -12n \\ \hline 6n = 24 \\ n = 4 \end{array}$$

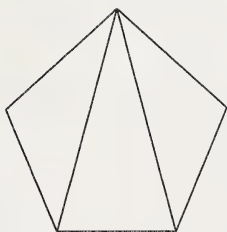
It takes the second cyclist 4 h to catch up to the first cyclist.



16.



17. a. There are several pairs of supplementary angles in the diagram. Any of these pairs can be named: $\angle 1$ and $\angle 2$, $\angle 2$ and $\angle 16$, $\angle 15$ and $\angle 16$, $\angle 15$ and $\angle 1$, ...
- b. There are several pairs of opposite angles in the diagram. Any of these pairs can be named: $\angle 1$ and $\angle 16$, $\angle 2$ and $\angle 15$, $\angle 3$ and $\angle 5$, $\angle 4$ and $\angle 17$, ...
- c. The pentagon can be divided into 3 triangles.

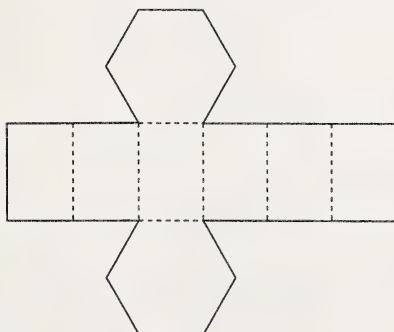


$$3 \times 180 = 540$$

So, the sum of $\angle 16$, $\angle 17$, $\angle 18$, $\angle 19$, and $\angle 20 = 540^\circ$.

18. a. hexagonal prism

b.



- c. There are two ways to find the surface area. One method is shown.

$$\begin{aligned} B &= \frac{6 \times 20 \times 17}{2} \\ &= \frac{2040}{2} \\ &= 1020 \end{aligned}$$

$$\begin{aligned} P &= ns \\ &= 6 \times 20 \\ &= 120 \end{aligned}$$

$$\begin{aligned} SA &= 2B + PH \\ &= 2 \times 1020 + 120 \times 30 \\ &= 2040 + 3600 \\ &= 5640 \end{aligned}$$

The surface area is 5640 cm^2 .

d. $V = BH$
 $= 1020 \times 30$
 $= 36\,600$

The volume is $25\,500 \text{ cm}^3$.

19. $\frac{60}{100} \not\sim \frac{n}{125}$

$$\begin{aligned} 60 \times 125 &= 100n \\ 7500 &= 100n \\ 75 &= n \end{aligned}$$

Peter scored better than 75 of the 125 students.

20. a. The mode is \$10. (It is the most frequent amount.)

b.
$$\frac{2 + (2 \times 4) + (3 \times 6) + (4 \times 8) + (5 \times 10)}{15} = \frac{2 + 8 + 18 + 32 + 50}{15}$$

$$= \frac{110}{15}$$

$$\doteq 7.33$$

The mean is about \$7.33.

- c. \$2, \$4, \$4, \$6, \$6, \$6, \$8, (\$8), \$8, \$8, \$10, \$10, \$10, \$10, \$10

The median is \$8.

- d. $10 - 2 = 8$

The range is \$8.

21. February has 28 days except in a leap year, when it has 29 days. A leap year occurs every four years.

a. $P(\text{exactly 30 days}) = \frac{0}{4}$
 $= 0 \text{ or } 0\%$

The probability is 0 or 0%.

b. $P(\text{exactly 29 days}) = \frac{1}{4}$
 $= 0.25 \text{ or } 25\%$

The probability is $\frac{1}{4}$, 0.25, or 25%.

c. $P(\text{exactly 28 days}) = \frac{3}{4}$
 $= 0.75 \text{ or } 75\%$

The probability is $\frac{3}{4}$, 0.75, or 75%.

d. $P(\text{more than 27 days}) = \frac{4}{4}$
 $= 1 \text{ or } 100\%$

The probability is 1 or 100%.

22. Let W = white, G = grey, R = red, ℓ = left, and r = right



- a. There are nine possible outcomes. Three outcomes result in a matching pair.

$$\begin{aligned} P(\text{matching pair}) &= \frac{3}{9} \\ &= \frac{1}{3} \\ &= 0.\dot{3} \text{ or } 33\frac{1}{3}\% \end{aligned}$$

The probability is $\frac{1}{3}$, $0.\dot{3}$, or $33\frac{1}{3}\%$.

- b. There are nine possible outcomes. There is only one way to get a red pair.

$$\begin{aligned} P(\text{red pair}) &= \frac{1}{9} \\ &= 0.\dot{1} \text{ or } 11\frac{1}{9}\% \end{aligned}$$

The probability is $\frac{1}{9}$, $0.\dot{1}$, or $11\frac{1}{9}\%$.

MATHEMATICS 9

FINAL TEST

GENERAL INSTRUCTIONS

YOU HAVE **TWO** HOURS TO COMPLETE THIS TEST. This test is to be completed independently under supervision without the use of any resource materials; however, you may use a calculator and geometry set. Work through the entire test answering the questions you are sure you know. You will then be able to concentrate on the questions of which you are not quite sure.

TOTAL MARKS: 100

Value

When answering the following questions, show all the necessary work and give complete answers.

(10 marks)

1. Perform the following operations.

a. $-\frac{1}{2} + \frac{1}{3} + \frac{1}{6} + \frac{5}{6}$

b. $1 - \left[\left(\frac{3}{8} - \frac{1}{2} \right) \div \frac{1}{4} \right]$

c. $3 + 3^2 + 3^3$

d. $2^4 \times 2^3 \div 2^2$

e. $\left[(2 - 3)^3 \right]^2$

(2 marks)

2. Fill in the following blanks.

- a. When two negative rational numbers are multiplied, the product is always _____ .
- b. When a negative rational number is subtracted from a positive rational number, the difference is always _____ .

Name of Student _____

Student I.D. # _____

Name of School _____

Date _____

(2 marks)

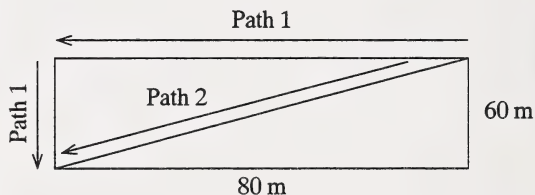
3. It is estimated that the insect population of the world is 1×10^{18} or 1 000 000 000 000 000 000. Shawn killed a fly and said, "Now there are 999 999 999 999 999 999 insects left." Was Shawn's statement correct? Why or why not?

(2 marks)

4. The diameter of a virus is 0.000 009 95 mm. Express this diameter in scientific notation.

(3 marks)

5. There is a path along the length and width of a rectangular field as shown. There is a second path from one corner of the rectangular field to the opposite corner. How much longer is Path 1 than Path 2?



Name of Student _____

Student I.D. # _____

Name of School _____

Date _____

(3 marks)

6. A jar contains 40 one-dollar coins and has a total mass of 380 g. When the same jar has 30 one-dollar coins, it has a total mass of 310 g. What is the mass of each coin?

(6 marks)

7. Solve each of the following equations.

a. $2(x+3) = 7$

b. $3b+4 = b$

c. $5a-3 = 2a+3$

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

(6 marks)

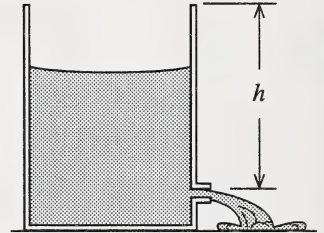
8. Solve each of the following inequations and graph the solutions.

a. $x + 3 > 7$

b. $2y < 10$

(4 marks)

9. The speed v in metres per second with which liquid discharges from a small hole in a container is given the formula $v = \sqrt{19.6h}$, where h is the height of the liquid above the hole in metres.



- a. What is the speed of the discharge if the height of the liquid above the hole is 5 m?

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

- b. What height of the liquid above the hole gives a discharge speed of 5 m/s?

(2 marks)

10. Write an equation to describe this relation: (1, 4), (2, 7), (3, 10), (4, 13), ...

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

(3 marks)

11. A pilot is flying at an altitude of 5000 m where the temperature is -21.8°C . The nearby airport where the pilot will land is at an altitude of 1000 m. If the temperature increases 6.5°C for every 1000-m decrease in altitude, what is the temperature at the airport?

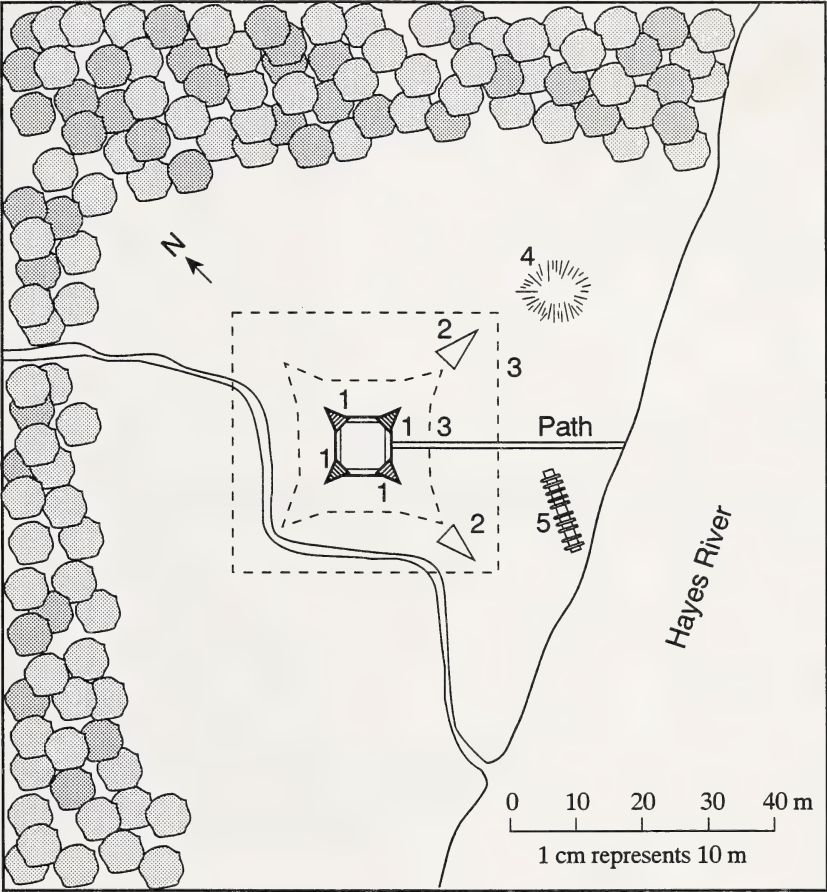
(3 marks)

12. In a box of chocolates, 30% have caramel centres, 40% contain nuts, 20% contain cherries, and the remaining five chocolates are cream-filled. How many chocolates are in the box?

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

(3 marks)

13. Below is a scale drawing of York Factory about 1750. What was the perimeter of the outer palisade?



- | | |
|---|------------|
| 1 Bastions used as stores and guardhouses | 4 Woodpile |
| 2 Large bastions | 5 Guns |
| 3 Palisade | |

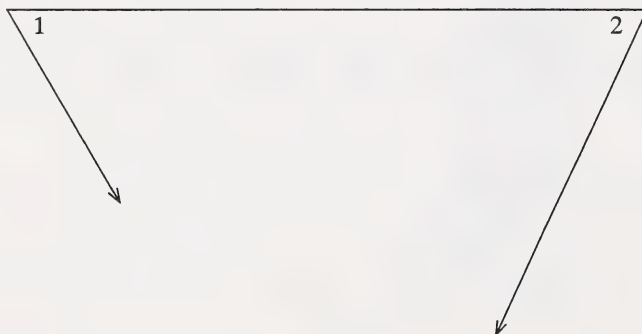
Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

(3 marks)

14. One cyclist leaves 2 h before a second cyclist. How long does it take the second cyclist to catch up to the first cyclist if the first cyclist travels at a speed of 12 km/h and the second cyclist travels at a speed of 18 km/h.

(3 marks)

15. Using only a straightedge, construct a third angle equal to the sum of $\angle 1$ and $\angle 2$. Label the angle $\angle 3$.



Name of Student _____

Student I.D. # _____

Name of School _____

Date _____

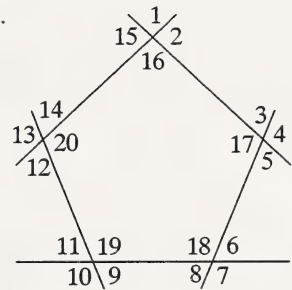
(3 marks)

16. Using only a compass and straightedge, construct an angle of 45° .

(6 marks)

17. Use the figure at the right to answer the following questions.

- a. Name a pair of supplementary angles.



Name of Student _____

Student I.D. # _____

Name of School _____

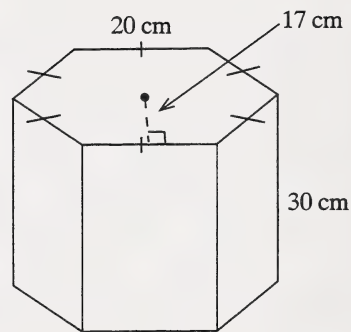
Date _____

b. Name a pair of opposite angles.

c. What is the sum of $\angle 16$, $\angle 17$, $\angle 18$, $\angle 19$, and $\angle 20$?

(8 marks)

18. Use the sketch at the right to answer the following questions.



a. Name the figure.

b. Make a sketch of the net of the figure.

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

- c. Find the surface area of the figure. d. Find the volume of the figure.

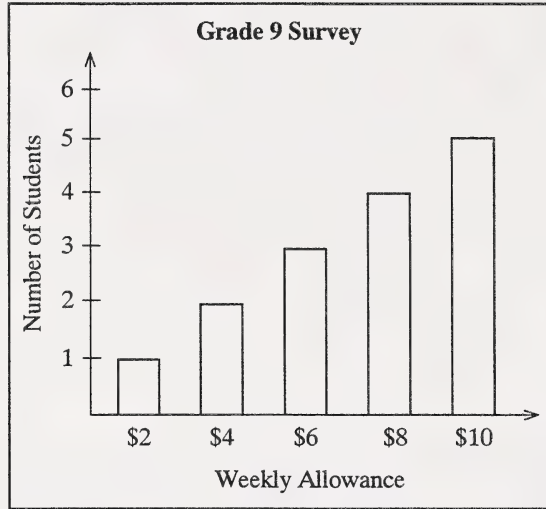
(2 marks)

19. 125 students wrote a mathematics test. Peter scored in the 60th percentile. What does this mean?

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

(8 marks)

20. The information displayed on the following graph was obtained from 15 students in Grade 9.



a. Find the mode.

b. Find the mean.

c. Find the median.

d. Find the range.

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

(8 marks)

21. What is the probability that in any year chosen at random the month of February has the following number of days?

a. exactly 30 days

b. exactly 29 days

c. exactly 28 days

d. more than 27 days

22. There are three pairs of gloves: white, grey, and red. All the left-hand gloves are in one pile. All the right-hand gloves are in the other pile. Without looking, you take one glove from each pile.

a. What is the probability of choosing a matching pair of gloves?

b. What is the probability of choosing a pair of red gloves?

Name of Student _____

Student I.D. # _____

Name of School _____

Date _____

TEACHER QUESTIONNAIRE FOR MATHEMATICS 9

This is a course designed in a new distance-learning format, so we are interested in your responses. Your constructive comments will be greatly appreciated so that a future revision may incorporate any necessary improvements.

Teacher's Name _____ Area of Expertise _____

School Name _____ Date _____

Design

1. The modules follow a definite systematic design. Did you find it easy to follow?

☐ Yes ☐ No If no, explain.

2. Did your observations reveal that the students found the design easy to follow?

☐ Yes ☐ No If no, explain.

3. Did you find the Learning Facilitator's Manual helpful?

☐ Yes ☐ No If no, explain.

4. Part of the design involves stating the objectives in student terms. Do you feel this helped the students understand what they were going to learn?

☐ Yes ☐ No If no, explain.

5. The Learning Facilitator's Manual contains Assignment answers and a sample test. Did you find these helpful?

☐ Yes ☐ No If no, explain.

6. Did the enrichment and remediation prove to be helpful?

☐ Yes ☐ No If no, explain.

7. Were students motivated to try the enrichment and remediation?

☐ Yes ☐ No If no, give details.

8. Suggestions for computer and video activities are included in the course. Were your students able to use these activities?

☐ Yes ☐ No Comment on the lines below.

9. Were the assignments appropriate?

☐ Yes ☐ No If no, give details.

10. Did you fax assignments? ☐ Yes ☐ No

11. If you did fax, did you get satisfactory results from using this procedure?

☐ Yes ☐ No If no, give details.

Instruction

1. Did you find the instruction clear?

☐ Yes ☐ No If no, give details.

2. Did your observations reveal that the students found the instruction interesting?

☐ Yes ☐ No If no, give details.

3. Did you find the instruction adequate?

☐ Yes ☐ No If no, give details.

4. Was the reading level appropriate?

☐ Yes ☐ No If no, give details.

5. Was the work load adequate?

☐ Yes ☐ No If no, give details.

6. Was the content accurate and current?

☐ Yes ☐ No If no, give details.

7. Did the content flow consistently and logically?

☐ Yes ☐ No If no, give details.

8. Was the transition between booklets smooth?

☐ Yes ☐ No If no, give details.

9. Was the transition between print and media smooth?

☐ Yes ☐ No If no, give details.

Additional Comments

Thanks for taking the time to complete this survey. Your feedback is important to us.

Fax Number: 674-6686

Instructional Design and Development Unit
Alberta Distance Learning Centre
Box 4000
Barrhead, Alberta
T0G 2P0

Note: Please ensure that each of your students has completed and forwarded a copy of the Course Survey.

